

CONTRACT 229944

April 29, 2003

Central Puget Sound Regional Fare Coordination Project Smart Card System Procurement

Division III: Equipment Specifications

Community Transit

King County Metro

Kitsap Transit

Sound Transit

Washington State Ferries

Pierce Transit

Everett Transit

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6.III-1 GENERAL TECHNICAL REQUIREMENTS

The General Technical Requirements shall be applicable to all RFCS equipment, unless more specific subsystem specifications are provided in the subsequent Sections.

6.III-1.1 Physical and Materials Requirements

- (a) All equipment shall be designed for use in the transit industry, with specific attention to ergonomics, reliability, efficiency, and safety for passengers, operators, maintenance personnel and other system users.
- (b) Equipment furnished under these specifications shall be the latest model in current production, as offered to commercial trade, and shall conform to quality workmanship standards and use materials consistent with transit industry requirements.
- (c) The Contractor shall represent that all equipment offered under these specifications is new.
- (d) Used, shopworn, demonstrator, prototype, re-manufactured, reconditioned, or discontinued models are not acceptable.
- (e) All external screws, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material; no self-tapping screws shall be used unless specifically approved.
- (f) All parts shall be made of corrosive resistant material, such as plastic, stainless steel, anodized aluminum or brass.
- (g) Equipment shall be designed to prevent unauthorized access, and to facilitate authorized access.

1.1.1 ADA Requirements

All equipment and devices shall comply with the requirements of *49 CFR Parts 27, 37, and 30* as amended through the date of this Contract, implementing the provisions of the Americans with Disabilities Act (ADA) of 1990, as amended.

1.1.2 Modular Design

- (a) The Contractor shall utilize modular design throughout.
- (b) Standard, commercially available components shall be used wherever possible.

- (c) All functionally identical modules, assemblies and components shall be fully interchangeable between all equipment acquired under this contract.
- (d) All modules and assemblies shall be connected using standardized durable, positive-locking, indexed quick disconnect fasteners.

1.1.3 Upgradeability

All equipment shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to reconfigure I/O options, or to maintain compatibility with ISO 14443 standards as they are developed and adopted.

1.1.4 Vandalism

Contractor shall include provisions to protect all equipment and components from common vandalism and physical abuse by individuals wielding portions of their body, or wooden or metallic implements.

6.III-1.2 Software Requirements

1.2.1 General Software Requirements

- (a) All software shall be written in a common and well-known modern high-level, highly structured language.
- (b) All software shall be the current version in production at the time of Phase II installation. Software versions to be approved by the Contract Administrator.
- (c) All software shall contain version control numbers.
- (d) Features shall be provided to identify the software version on each device, and verify that it is the correct or most recent version for that device.
- (e) All use of assembly/machine language shall be submitted for review and approval during the design review.
- (f) Software shall be organized in a modular, table-driven fashion to the extent possible.
- (g) Adjustable, Agency specific and customization parameters shall not be hard-coded onto the source-code; they shall be user-modifiable.

- (h) Application software (both user and system) shall be portable, i.e. the source code shall be transferable to other computers using the same operating system without any modifications.
- (i) The application software shall be scaleable to newer, higher performance hardware or operating systems.
- (j) The application software design shall be developed using structured software development methods (to be approved by the Contract Administrator), and shall be submitted for the design review.
- (k) The system shall contain all supporting software required to implement, operate, modify, and maintain all graphics displays and interactive screens.
- (l) Passwords shall not be displayed on Video Display Units.
- (m) All software shall be self-diagnostic.
- (n) All source code shall include application and individual module descriptions.
- (o) All user and system interfaces shall have online help features.
- (p) The operating system should be standardized for all systems and Year 2000 operability must be provided.

1.2.2 National Architecture Conformance

- (a) The RFCS shall demonstrate conformance with the Intelligent Transportation Systems (ITS) National Architecture as defined in 6.III-1.2.2(b). Information on the National Architecture can be found at <http://www.its.dot.gov/aconform/aconform.htm>
- (b) The Contractor shall prepare and submit for review and approval a National Architecture Conformance Plan (CDRL 30), including at a minimum the following:
 - i. Elements of the RFCS affected
 - ii. Applicable standards
 - iii. Description of approach to achieving ITS conformance
 - iv. Description of conformity to the Central Puget Sound ITS Regional Architecture. Reference documents are available at:
http://www.psrc.org/datapubs/pubs/reg_arch.htm
and

<http://www.psrc.org/projects/its/documents/guidance.pdf>

The RFCS project is included in the Regional Architecture.

- v. Approach to achieving the requirements of “Federal Transit Administration National ITS Architecture Policy on Transit Projects, Section VI, Project Implementation”. This document is available online at http://www.its.dot.gov/aconform/Policy_2.htm
 - vi. Approach to incorporating the emerging Transit Communication Interface Profiles (TCIP). It is the Agencies desire to develop component and subsystem interfaces that are open, defined, and compliant with the emerging TCIP standards. At a minimum, fare transaction data elements downloaded to the DACS shall utilize TCIP where possible, and the FTP shall be able to accept location data in TCIP format. Information on TCIP can be found at <http://www.ite.org/standards/tcip.asp>
- (c) As part of the National Architecture Conformance Plan, the Contractor shall identify the applicability of, and compatibility with, the emerging Dedicated Short Range Communications (DSRC) standard. For current information regarding this standard contact:

Mr. William Jones
Technical Director
US DOT, ITS Joint Program Office
400 Seventh Street SW
Room 3416, Mailstop HOIT-1
Washington, DC 20590
Tel: 202-366-2128
email: william.s.jones@fhwa.dot.gov

6.III-1.3 System Security

The Contractor shall develop a comprehensive System Security Plan (CDRL 31) which identifies the system elements which require protection, and identifies mechanisms, procedures and processes to counter security threats to those elements.

- (a) The System Security Plan shall describe the intended functionality for each of the system security elements, shall identify security threats, and shall describe procedures, functions and systems for detecting and mitigating those threats.
- (b) The System Security Plan shall identify system users, and describe rules that govern how those users will have access to system data, resources and processes.

- (c) The System Security Plan shall identify methods of detecting security breaches regardless of whether there is a detectable change in the performance of the system. All security breach detection's shall be confidential, and accessible only to users with appropriate access permission.
- (d) Security provisions for Agency-supplied and Contractor-supplied communications networks shall be described.
- (e) The System Security Plan shall be submitted with the design documentation.
- (f) The System Security Plan shall be approved by the Contract Administrator.
- (g) The Contractor shall implement system security services to achieve the approved System Security Plan.
- (h) The Contractor shall be responsible for providing security for Contractor-supplied RFCS equipment and facilities, and security recommendations for Agency-supplied RFCS facilities equipment regardless of existing security facilities and systems provided by the Agencies or others.

1.3.1 System Elements and Protection

- (a) At a minimum, the system security shall protect the following types of RFC system elements:
 - i. Equipment and facilities installed in public locations.
 - ii. Equipment and facilities installed in Contractor-owned or operated locations.
 - iii. Equipment and facilities installed in Agency-owned facilities.
 - iv. Software source and compiled code.
 - v. Data communications and interfaces.
 - vi. Other communications and interfaces as might be required for the work.
 - vii. System data.
- (b) The Contractor shall coordinate with each Agency to develop system security elements and procedures that function with existing Agency firewalls and shall identify for each Agency any recommended measures to secure Agency-supplied communications networks.

1.3.2 System Security General Services

At a minimum, the system security shall provide the following types of services:

- (a) All RFC systems, subsystems and devices shall allow only authorized users access.
- (b) The system shall provide access control based on the establishment of groups, users and roles:
 - i. Groups, users and roles shall be assigned during system implementation as directed by the Contract Administrator.
 - ii. A minimum of ten (10) groups shall be provided for.
 - iii. Each user shall have a unique identification and password.
 - iv. The system shall include flexibility to add new groups, roles and users, redefine groups and roles, and reassign access permission as part of normal system operations. Access permission shall be assigned by the System Administrator.
- (c) All system access shall be recorded.
- (d) The system security shall include features to limit the propagation of access permission.
- (e) For all data transactions, the system security shall include authentication features to verify that all claimed source, recipient or user identities are correct and valid.
- (f) All data transactions shall include non-repudiation features to verify message content, and resolve claims that data was not correctly originated or received by a certain user.

1.3.2.1 Protection from Unauthorized Access

As a minimum, the system security shall provide protection from intentional or accidental unauthorized access including the following:

- (a) Physical access to equipment or facilities.
- (b) Access to Contractor provided computing systems and software.
- (c) Access to Agency computing systems and software.
- (d) Access to funds, accounts and funds-related data, owned and non-owned.

- (e) Destruction, removal, corruption or modification of data or other resources.
- (f) Interruption of service, including as a minimum component, device, subsystem or system operation, and system communications.
- (g) Access to any system stored or created data.

1.3.2.2 Data Integrity

The system security shall provide features to maintain data integrity, including as a minimum:

- (a) Error checking shall be provided.
- (b) Data transferred from a device or system shall not be purged or written over until a successful transfer is confirmed.
- (c) Features shall be provided to ensure that all transaction and system-created files are uniquely identified, and that no files are lost or missed during data transfer. Verification features shall be provided to confirm that there have been no losses of data at any point in the system.
- (d) Verification features shall be provided to confirm that there have been no unauthorized changes to or destruction of data.
- (e) Features shall be provided to automatically detect, correct and prevent the propagation of invalid or erroneous data throughout the system.

1.3.2.3 Data Confidentiality

- (a) The following types of confidential data shall be maintained in the system:
 - i. Transaction data related to an individual Agency, employer or other system user
 - ii. Personal information on cardholders
 - iii. Revenue and other system-confidential data.
- (b) The system security shall include the following minimum data confidentiality features:
 - i. Features to prevent access to personal or other confidential data by unauthorized users

- ii. Features to prevent unauthorized association of a user identity with user-specific activities
- iii. Recording and audit of actions taken by that user.

1.3.3 Security Mechanisms

The Contractor shall identify and document the specific mechanisms to be used to implement the system security services in accordance with the plan. At a minimum, the following information shall be provided.

- (a) For non-cryptographic mechanisms:
 - i. Identification of the security devices for equipment and personnel.
 - ii. Description of access control for applications.
 - iii. Description of the secure routes for the transmission of data and resources.
 - iv. Participants certification process.
 - v. Trusted hardware and software components.
 - vi. Security access process as granted by defined roles.
- (b) For cryptographic mechanisms:
 - i. Description of encryption, including symmetric (private key) and/or asymmetric (public key), for confidentiality.
 - ii. Description of the hash functions for message integrity checks.
 - iii. Description of the digital signatures for authentication and non-repudiation.
- (c) For cryptographic support mechanisms of keys:
 - i. Generation, distribution and archiving.
 - ii. Directories and certification.
 - iii. Recovery/escrow.

1.3.4 Alarms

- (a) As a minimum, the system shall provide the following alarms, and shall notify the appropriate users in the event an alarm is triggered:
 - i. Detection of invalid or erroneous data.
 - ii. Detection of a security breach.
 - iii. Detection of a device or system fault.

To the extent the Contractor is unable to access an Agency-supplied communications network in a manner necessary to directly monitor and detect security breaches within said network, the Contractor shall be restricted to information collected by the SNMP server within the Agency (as per section 6.II-8.2.1(d)). The Contractor shall immediately notify the subject Agency of any problems thereby detected.

- (b) All alarms and SNMP traps accessible to Contractor shall be recorded and stored in a database, along with a history of corrective actions.
- (c) Users with associated privileges shall be able to manually override alarms.
- (d) Alarms that are manually overridden shall reactivate at a user-defined period until corrective action is taken and the alarm cleared.

6.III-1.4 Data Backup and Recovery

- (a) The Contractor shall prepare a comprehensive data backup and recovery plan. (CDRL 5)
- (b) The Contractor shall provide a data backup system for data archiving and recovery. The data backup system shall include capabilities for an Agency to back up data through network-wide backup.
- (c) It shall be possible to recover and transfer data files in the event of a primary data storage failure through a secondary standardized PC interface such as an RS 232 port.
- (d) In the event of a primary data storage failure and/or backup data storage battery failure, an indication on the display shall alert the clearinghouse system.
- (e) Correct password entry shall automatically enable RFCS device to download the transaction data to the back-up device.
 - i. Neither the RFCS equipment nor the backup device shall capture the correct password.
 - ii. Unsuccessful attempts to enter the password shall be logged.
 - iii. The log shall contain detailed information, including the date, time, location, RFCS equipment number, and erroneous password.
- (f) An alternate process for initiating data extraction and/or alternate means of removing data records may be provided which shall be subject to Contract Administrator review and approval.

- (g) The Contractor shall provide a detailed description of alternate process for initiating data extraction and/or alternate means of removing data records and the technical details necessary for Contract Administrator evaluation.

6.III-1.5 System Reliability and Availability Requirements

1.5.1 Reliability Requirements

Reliability is defined as Mean Transactions Between Failures (MTBF) that a specific type of RFCS equipment in service is performing. Transactions are defined as completed load or payment transactions. Figure III-1.1 provides a summary of the reliability requirements for relevant RFCS equipment.

- (a) In a **low transaction volume environment**, reliability (MTBF) shall be calculated as follows:
- i. Operating time for each type of equipment shall be summed and the result divided by the number of chargeable failures. FTPs shall be considered operational unless reported non-operational.
 - ii. A **low transaction volume environment** is defined as any FTP processing zero (0) up to 250 transactions per day.
- (b) In a **high transaction environment**, reliability shall be calculated as follows:
- i. All transactions (full patron cycle) for each type of equipment shall be summed and the result divided by the number of chargeable failures.
 - ii. A **high transaction volume environment** is defined as any FTP processing 251 and higher transactions per day.

**Figure III-1.1
EQUIPMENT RELIABILITY SECTION REFERENCES**

| Equipment | Section Reference |
|---|----------------------------|
| Fare Card | 6.III-2.3.1 6.III-2.3.2 |
| Fare Transaction Processor (all configurations) | 6.III-3.3.2 |
| Driver Display Unit | 6.III-6.3 |
| Wireless Data On-Off Load System | 6.III-7.3 |
| TVM Integration | 6.III-10.3 |
| Customer Service Terminal | 6.III-11.3 |
| Data Collection System | 6.III-12.3 |
| Back Office Client Computer | 6.III-13.5 |

1.5.2 Availability

The Contractor shall prepare a System Availability Measurement Plan (CDRL 39). Availability is defined as the probability that a device, a subsystem of a device, or a data server or computer system is operating. The base equation presented in Figure III-1.2 shall be used to calculate availability. The four primary components of availability are:

- (a) **Required operating hours** = time the equipment is required to be available to conduct transactions or other operational activities.
- (b) **Scheduled maintenance hours** (as applicable) = time required for predefined scheduled equipment and system maintenance and servicing activities.
- (c) **Required revenue servicing hours** = time required for revenue servicing activities such as exchanging money containers, and replenishing card and receipt stock.
- (d) **System out-of-service hours** = time that the relevant system is not available to conduct transactions within the predefined scheduled operating window.

Figure III-1.2
AVAILABILITY BASE EQUATION

$$\text{Availability} = \frac{\text{Effective operating hours} - \text{System out-of-service hours}}{\text{Effective operating hours}}$$

where: effective operating hours = [required operating hours - (scheduled maintenance hours + required revenue servicing hours)].

1.5.3 Failure Review Team

A Failure Review Team (FRT) shall be established to evaluate which failures are chargeable against the Contractor's reliability requirements. The FRT shall be comprised of, as a minimum, one member from the Agencies or designated Agency representative, and as a minimum one member from the Contractor. Responsible parties within this team will initially attempt to settle any disputes. The Contract Administrator will give its opinion on any disputes that remain unsettled after a period of two weeks after the FRT meets to evaluate a specific failure. In the event the Contractor does not agree with the Contract Administrator, it may resolve the issue pursuant to the disputes procedure set out in Section 3.I-72, Conflict Resolution.

1.5.4 Corrective Action

- (a) In the event that the devices do not meet the reliability requirements, the Contractor shall identify and implement remedial action, including, as necessary, modification of the equipment, on-

site engineering services, on-site technical services, or other related action at no cost to the Agencies.

- (b) In the event the installed equipment does not meet these requirements, and remedial action requires the Contractor to take an individual device (other than depot maintenance devices) out of service for more than 12 hours to implement equipment modifications or replacement, the Contractor shall arrange for a supplemental device at that location as necessary, so there is no reduction in service while remediation is taking place.
- (c) The Contractor shall provide a replacement device within 24 hours of notification.

6.III-1.6 Electrical Requirements

1.6.1 Equipment Power Supply

All Equipment installed in Agency or third party facilities with the exception of any on-board equipment shall operate from a nominal line voltage of 120 VAC, within voltage tolerances of +10% to -10%, and a frequency range of 57 Hz to 63 Hz without equipment damage.

1.6.2 Electrical Protection and Grounding

- (a) The Contractor shall provide equipment that meets applicable specifications and criteria of the Underwriters Laboratories Incorporated (UL), National Electrical Code (NEC), and the regulations of the State of Washington and local jurisdictions.
- (b) The Contractor shall be responsible for securing Underwriters Laboratories and other electrical certifications, and shall be responsible for any costs associated with the certification process and/or inspections.
- (c) All device enclosures shall contain an easily accessible master circuit breaker that will remove power from the equipment when tripped. Circuit breakers shall clearly indicate when they have been tripped.
- (d) All enclosures, chassis, assemblies, panels, switch boxes, terminal boxes, and similar enclosures or structures shall be grounded.
- (e) Protective grounding shall be provided to ensure that all exposed metal equipment and metal fixtures are connected to a common ground point in the electrical cabinet.

1.6.3 Wiring

- (a) Conductors that have the potential of operating at 50 volts or more shall not be bundled with any other lower voltage conductors.
- (b) Wire dress shall allow sufficient slack for three (3) additional “re-terminations” without excess tension.
- (c) Wire splices are not permitted.
- (d) Wire and cable ties shall not be so tight as to cause indentation and damage to the insulation.
- (e) Adhesive-mounted bases shall not be used to support wire ties or cable supports.
- (f) All conductors within each enclosure shall be installed free from metal edges, bolt heads, and other sharp or interfering points.
- (g) All conductors providing connections between components shall be provided with strain-relief, and be clear of moving objects that could damage either the conductor or the object.
- (h) All terminations and cables must be clearly indexed, labeled and schematically identifiable. All wire labels shall be non-metallic and shall resist standard lubricants and cleaning solvents.
- (i) When components must be connected to each other through individual wires, the wiring shall be incorporated into a wiring “harness,” where each branch of each circuit can be separated from others for troubleshooting.
- (j) All components interconnected through individual wires contained within a “harness” shall be disconnected from the harness by disconnecting a durable, positive-locking, indexed quick disconnect fastener.

1.6.4 Printed Circuit (PC) Boards

- (a) Where possible, all components shall be connected to the main logic circuitry by plugging into slots on a printed circuit “backbone.”
- (b) All PC boards shall be interchangeable with the same printed circuit board on other devices purchased under this contract.
- (c) All PC boards that have through holes shall be through hole plated.

- (d) All PC boards shall be at least NEMA Grade FR-4, epoxy glass, green with weave appearance, and shall have a heat/mechanical load limit of 5. The 5 indicates the “peel strength” of the laminate (pounds per inch of width needed to peel off a strip of copper cladding at an elevated temperature, NEMA publication LI 1-1971). The copper laminate shall be firmly affixed to the PC board and shall not blister or peel when heated with a soldering iron.
- (e) The component side of the board shall be silk-screen printed with component references and other identifying information which corresponds to PC board schematics to aid in repair and troubleshooting.
- (f) Sufficient clearance between components shall be provided to allow for component testing, removal, and replacement.
- (g) Identifiable test points for circuit troubleshooting shall be provided on modules and PC boards.
- (h) All markings on PC boards shall be in English.
- (i) All PC boards shall have a unique, permanent serial number that cannot be altered during normal repair.
- (j) Fuses or built-in protection shall be provided on all driver circuits to prevent damage to those transistors or other devices that drive relays, solenoids, print heads, and motors. The fuses shall be easily replaceable without damaging the PC board.
- (k) All PC boards shall be “indexed” to prevent insertion in the wrong slot or the wrong direction.
- (l) All PC boards shall contain the manufacturer catalog or reference number, version level and serial number for tracking purposes. All such identifiers shall be permanently affixed to the board.
- (m) PC boards in on-board equipment shall employ pin/socket connectors, and shall not use printed card edge fingers.

1.6.5 Relays

- (a) The contact tips of any relays shall not be placed in parallel for the purpose of carrying a current load at or above the manufacturer's contact tip rating.
- (b) Bifurcated contacts shall be used in low-voltage applications whenever necessary due to dry contact switching requirements.

- (c) All relays shall be installed such that they are fully accessible for testing, removal and replacement.
- (d) All relays shall be socketed with captive spring retainers to hold relays in place.

1.6.6 Switches

- (a) Poles of switches shall not be placed in parallel to carry current at or in excess of manufacturer's contact pole rating.
- (b) Switches shall be provided with a "keying" feature such that, after installation, the body of the switch will be constrained from mechanical rotation.

1.6.7 Equipment Enclosures

Equipment will be installed in indoor and outdoor environments, with various levels of sheltering ranging from significant protection to none. All outdoor equipment shall be designed for exposure to salt laden marine air, fog, rain, hail, and other environmental conditions prevalent in the Puget Sound Area.

- (a) RFCS equipment shall be able to operate under additional environmental requirements presented in the respective subsystem technical specifications as applicable.
- (b) Enclosures shall include any provisions necessary to maintain the internal equipment at an acceptable temperature and humidity.
- (c) Enclosures shall be designed to prevent entry of moisture during a driving rainstorm and to minimize entry of dust.
- (d) Any moisture or dust entering the enclosure shall not cause short circuits or equipment failure.

6.III-1.7 Environmental Requirements

1.7.1 Electromagnetic Compatibility

The Contractor's approach to electromagnetic compatibility shall ensure that the electrical and electronic components and subsystems operate in their intended operational environments without being affected by or causing harmful interference. Protection shall be provided against radio frequency and electromagnetic interference (RFI/EMI) emission sources, as well as internal conductive or inductive emissions.

- (a) Operation of RFCS equipment shall not be affected by the electromagnetic fields generated by utility transmission lines, by

an overhead catenary at distances as close as 25 feet, or by local power distribution lines at distances as close as 50 feet.

- (b) Operation of RFCS equipment shall not be affected by electromagnetic effects present during transit operations such as electric trolley buses and light rail vehicles.
- (c) Operation of RFCS equipment shall not affect or be affected by equipment in the Bus Tunnel, LRT right-of-way or at WSF terminals.
- (d) Operation of RFCS equipment shall not affect or be affected by other on-board equipment including vehicle power supplies, radios, automatic vehicle identification systems, and on-board data collection and processing equipment.
- (e) Contractor shall describe what provisions shall be included for EMI/RFI protection.
- (f) The Contractor shall certify through the Contractor's expense the electromagnetic compatibility of equipment to be furnished.
(CDRL 32)
- (g) Equipment shall meet applicable codes, standards and specifications at the time of manufacture.
- (h) On-board equipment and card reading equipment connected to a customer service terminal, Sound Transit ticket vending machine or other revalue device shall meet the following standards. Subject to written approval from the Contract Administrator, the Contractor may apply for a waiver of EMC testing under this contract for on-board equipment, office-based computer equipment, card reading equipment installed at Sound Transit ticket vending machines, and other equipment that has received EMC certifications and approvals from third parties. All waiver requests shall be on a device-by-device basis, and shall include backup documentation and certifications in support of the request. Any testing waiver issued by the Contract Administrator shall not be construed to relieve the Contractor from the requirement that the equipment satisfy all applicable codes and standards as specified in this Section 6.III-1.7.

| Specification | Standards |
|---------------------------|-------------------|
| Electrostatic Discharge | IEC(EN) 61000-4-2 |
| Radiated Electric Field | IEC(EN) 61000-4-3 |
| Conducted Electric Field | IEC(EN) 61000-4-6 |
| Conducted Transient Burst | IEC(EN) 61000-4-4 |

| | |
|-----------------|--------------------|
| Conducted Surge | IEC(EN) 61000-4-5 |
| Magnetic Fields | IEC(EN) 61000-4-8 |
| Emissions | CISPR 22 (EN 5022) |

6.III-1.8 System Documentation

1.8.1 Documentation Control and Management

- (a) All software and versions used to produce documentation shall be provided to and approved by the Contract Administrator.
- (b) All system documentation, including manuals and training materials, shall be available for download via a project website.
- (c) Unless otherwise specified at least nine (9) paper and electronic copies of documentation shall be provided to the Contract Administrator.
- (d) All draft electronic documentation shall be provided in Adobe Acrobat PDF format suitable for printing. All final electronic documentation shall be provided in both Adobe Acrobat PDF format and native file format.
- (e) The Agencies shall have the right to reproduce and reuse all documentation, subject to Intellectual Property rights and requirements as defined in Division I. In all cases, the Agencies shall have the right to reproduce, reuse and distribute all documentation within an Agency for the purpose of operating and maintaining the RFCS.

1.8.1.1 Documentation Website

The Contractor shall establish and manage all system documentation via a project website

- (a) All documentation shall be downloadable in a usable format through this website.
- (b) Access to the website and access to documents within the website shall be user and password controlled and available only to users as necessary, as identified by the Contract Administrator.
- (c) The Contractor shall update the website with the latest versions of documents throughout the Contract.
- (d) Documentation shall be in the English language.

- (e) Website structure shall be indexed using system documentation type and/or a logical grouping.

1.8.2 Manuals

1.8.2.1 General Requirements

The Contractor shall supply the full complement of manuals and documentation required to train Agency personnel to operate and maintain all system components installed in or on Agency facilities, or operated by the Agencies. Manuals shall be provided according to an agreed upon schedule (CDRL 33, Required Manuals Schedule). Manual shall be made available in two forms, on the project website and hard copy final versions provided to the Contract Administrator. All manuals shall be:

- (a) In the English language.
- (b) Divided and tabbed into logical and/or functional sections.
- (c) Indexed.
- (d) Cover both the hardware and the software associated with each system.
- (e) Updated as required over the life of the Contract to reflect all configurations operational in the field.
- (f) Furnished as “Controlled” documents and each manual shall contain a unique number.
 - i. All revisions shall be issued by manual number.
 - ii. Revisions to draft and approved manuals shall be recorded on a control list to be maintained in the front of each manual.
 - iii. The list shall be issued with each revision and shall contain the date of the revision and the page references for that revision.
- (g) The training documentation shall be separate from the operation and maintenance manuals, but may reference those manuals. (Training documentation requirements are defined in Section 6.II-12, “Training Requirements.”)

1.8.2.2 Paper Format

- (a) Manuals shall be designed to withstand continuous, long-term use in a commercial environment.

- (b) Manuals shall lie flat when opened and permit easy addition and replacement of pages.
- (c) Covers for all manuals shall be made from materials that are oil, water and wear resistant.
- (d) Pages shall be 8¹/₂ x 11 inch except where otherwise specified and double sided.
- (e) Sides of pages intentionally left blank shall be so noted.
- (f) Figures, illustrations, diagrams, and drawings shall be labeled as figures. Figures may be a maximum of 11x17 inch, folded to 8¹/₂ x 11 inch with the identification clearly marked.

1.8.2.3 Computerized Format

- (a) The Contractor shall supply manuals, catalogs, diagrams, views, illustrated parts catalog, troubleshooting flow charts, and schematic drawings in electronic form on CD ROM in the following formats:
 - i. Text shall be provided in the latest version (current production version at deployment, as agreed to by the Contract Administrator) of Adobe Acrobat, and Microsoft Word or approved commercially available word processing program for native format files.
 - ii. Drawings shall be provided in .eps or .dxf file formats.
 - iii. Graphics files shall be provided in TIFF, GIF and/or JPEG formats.
- (b) The Contractor shall be responsible for updating manuals to reflect current RFCS parameters in the event that changes are made to the system or operational procedures. Manuals shall be updated and maintained by the Contractor throughout the life of the Contract, and provided to the Agencies in a timely manner in the formats specified above.

1.8.2.4 System Operations Manual

Nine (9) copies of the System Operations Manual (CDRL 34) shall be provided. The Contractor shall include one (1) copy on an electronic file. The document shall include the following:

- (a) Complete diagrams.
- (b) Illustrations.

- (c) Instructions for operation of the system, including normal operating and communications procedures.
- (d) Diagnostic procedures.
- (e) Restart/recovery procedures.
- (f) Other necessary procedures for operating the system.
- (g) Complete descriptions of functions necessary for generating reports.

1.8.2.5 System Maintenance Manual

Nine (9) copies of the System Maintenance Manual (CDRL 35) shall be provided. This document shall be comprehensive and shall provide complete detailed technical descriptions of maintenance operations, including, but not limited to, the following:

- (a) General descriptions.
- (b) Theory of operations.
- (c) Preventive maintenance schedule and activities.
- (d) Troubleshooting techniques.
- (e) Corrective measures, both temporary and permanent.
- (f) Locations and availability of support services for all major components.
- (g) Point-to-point component wiring schematics.
- (h) Assembly and disassembly drawings.
- (i) Installation guidelines.
- (j) List of required maintenance tools. Complex tools and test equipment each require a separate operators manual (CDRL 36).
- (k) Component parts lists.
- (l) Schematic diagrams.

1.8.2.6 Software Documentation

Software Documentation (CDRL 37) shall be provided as described in the Contract.

1.8.2.7 Current Parts List (CPL)

The Contractor shall provide a comprehensive and detailed Current Parts List (CPL) for each and every component included in the system. Parts shall be numerically coded for inventory purposes.

- (a) The CPL (CDRL 38) shall be categorized and related to particular system components.
- (b) The CPL shall contain the source vendor's name, identification numbers and codes, or other means to identify the manufacturer of each component.
- (c) The CPL shall include prices and quantity discounts offered.
- (d) The CPL shall identify new component and products that will be developed for this application, as well as note which products are replacing existing equipment.

6.III-1.9 Audit

The Contractor shall provide the audit capabilities to track all RFCS transactions from conception to settlement.

- (a) The system shall create and maintain an audit trail of accesses to the objects it protects.
- (b) The audit mechanism shall permit the specific auditing of the actions of one or more users based on the individual's identity or security/administrative role.
- (c) Audit data shall be protected so that read access to the data is limited to those subjects authorized for review of audit data.

6.III-2 FARE CARD**6.III-2.1 Subsystem Description - Fare Card**

The RFCS fare card will be the regional fare media accepted at all participating transit Agencies for fare payment. It is the intent to introduce a contactless-only card to support the RFCS project, with the potential to accommodate a dual interface card in the future operating in parallel with the contactless-only card. All systems and equipment in the RFCS shall support the contactless interface.

- (a) The fare card (DR 101) shall be a memory or microprocessor smart card with a contactless interface. The contactless interface shall be used for all communications and transaction processing between the fare card and RFCS equipment.
- (b) The card shall be technically capable of both reading and updating uniquely stored RFCS information through the contactless interface.
- (c) Agency access to any non-RFCS applications that may be resident on the card shall be restricted without written authorization from the owner of the non-RFCS application.
- (d) The fare card shall be designed to support the addition of a magnetic stripe to ABA standards, and be imprinted with custom artwork and photographs on the front and back.
- (e) RFCS data shall not be accessible by any non-RFCS application without written authorization from the Contract Administrator.
- (f) The fare card shall include an electronic and printed serial number. In the event that the electronic serial number differs from the printed serial number:
 - i. The Contractor shall provide an electronic file cross referencing electronic and printed serial numbers with every card order.
 - ii. The RFCS shall provide access to all card information via either the electronic or printed serial numbers, and shall maintain a cross-reference of the two.

6.III-2.2 Functional Requirements - Fare Card**2.2.1 Card Operating System**

The Contractor shall provide a Card Operating System (COS) that conforms to the following requirements (DR 101.01):

- (a) The COS shall support a multi-application structure to allow for the creation and addition of new applications without interfering

with the existing ones. (If multiple applications are used in conjunction with an open electronic purse, then any application added to the card shall be subject to the approval of the open electronic purse association to ensure the integrity of the open purse scheme.)

- (b) The COS shall allow the updating and/or the removal of existing applications.
- (c) The Contractor shall provide detailed information of how the COS will be designed to secure and safeguard the integrity of transaction data stored on the card such as the file protection function, data encryption algorithms, and/or Message Authentication Code (MAC).
- (d) The Contractor shall provide detailed information on how data integrity will be maintained and transactions completed for contactless operation.
- (e) The transaction speed requirements specified herein shall not be impacted by the COS security features design, specifically through the card's contactless interface. The Contractor specifications (DR 101.02) in that regard are subject to Program Manager review and approval.
- (f) The fare card shall support blocking of Agency issued cards and blocking of the RFCS application on a third party issued card.
 - i. Requests for card unblocking shall be allowed by an authorized customer service representative only.
 - ii. The fare card shall support blocking only the RFCS application on a non-Agency issued card in a multi-application environment.
 - iii. The blocking and unblocking function shall be controlled by the clearinghouse in accordance with the RFCS policy.

2.2.2 Disposable Card

The Contractor shall provide disposable contactless-only cards (DR 101.03) that shall have limited functionality for short term applications in targeted markets at a low cost.

- (a) The disposable card shall be configurable in any denomination of value or pass validity, or as a visitor, group or special fare instrument.
- (b) The Agencies shall be able to order disposable smart cards pre-valued, or shall be able to value the cards at the time of issuance.

2.2.3 Smart Objects (Option)

The Contractor may provide Smart Objects (e.g. key chains) (DR 101.04) that have the contactless hardware embedded into the device. Smart Objects may have full RFCS functionality, or limited functionality.

- (a) Smart Objects shall serve specific applications in target markets.
- (b) Smart Objects shall have a unique serial number and may be reloadable.
- (c) The use of Smart Objects are subject to successful completion of all specified testing requirements.

2.2.4 RFCA/Facility Access Combination Card

The Contractor shall provide RFCS/Facility Access Combination Cards (Combo Cards) that provide both RFCS and facility access functionality. Such cards will be deployed by King County as the KC Employee ORCA ID.

- (a) Combo Cards shall meet the requirements of the RFCS Fare Card, and shall include functionality as required to communicate with facility access control systems that utilize Indala 125kHz, 26 bit Weigand proximity technology.
- (b) Facility access functionality shall be for the sole purpose of providing employee access to designated facilities. Data or information utilized for facility access shall not be used for any other purpose without the express written consent of the Contract Administrator.
- (c) The Combo Card's RFCS functionality, including but not limited to products, initialization processes, issuance processes, transaction processing, and reporting, shall be the same as for the RFCS Fare Card. Combo Cards will be considered Institutional Program cards.
- (d) Facility access functionality shall be compatible with the applicable Indala proximity card reader systems including facility codes and Indala card number encoding as provided by King County.
- (e) Combo Cards shall be pre-printed with the following information; no other information shall be pre-printed without consent of the Contract Administrator:

- a. The face of each Combo Card shall be in a portrait format and shall be pre-printed with the Card Serial Number in the lower left hand corner and the Card Verification Number in the lower right hand corner. The Card Serial Numbers will have a first digit that is different from other card types.
- b. The back of each Combo Card shall be in a landscape format and shall include only the Indala encoded card serial number in the lower right hand corner.
- (f) Combo Cards shall have a glossy finish suitable for secondary printing and personalization. King County will be responsible for any secondary printing or personalization of cards.
- (g) The Contractor shall be responsible for ordering test Combo Cards with Indala encoding as specified by King County unless otherwise agreed by the Contract Administrator. King County shall be responsible for testing the facility access functionality of the test Combo Cards.

6.III-2.3 Performance Requirements - Fare Card

2.3.1 Card Reliability

- (a) Card failure is defined as, but not limited to, the inability to complete a transaction, the loss of value due to IC chip failure or electrical connection, or physical mechanical failure of card material, except for physical damage of the card.
- (b) At a minimum, the card shall achieve at least a mean 10,000 transactions before card failure.
- (c) The Contractor shall provide the Contract Administrator with guidelines on verification of a card failure.
- (d) The mean defect rate for cards received in inventory shall be no greater than 0.1%.
- (e) The Contractor shall replace all defective cards at no charge immediately upon notification. If defective card problems persist, the Contractor shall also provide a written report detailing the technical explanations behind the causes of the problem, and shall correct the problem within 30 days after determination of cause.
- (f) The Contractor shall provide the Agencies with an option to switch to a different card supplier for further issuance at no additional charge to address reliability issues in a timely manner.

2.3.2 Useful Card Life

For all Agency issued cards, the fare card shall last the earlier of four (4) years or 10,000 transactions as stated in 2.3.1 “Card Reliability” when used on a daily basis under normal circumstances for fare payment.

- (a) In the event the card graphics are a critical security feature, the graphics shall not deteriorate for at least three years when used on a daily basis under normal circumstances for fare payment.
- (b) If the RFCS application is loaded on a non-RFCS issued card, then the card life may be that of the card as established by the third party card issuer.
- (c) The pre-printed design common to all cards shall be sealed under a clear plastic laminate to protect the image.

6.III-2.4 Physical Requirements - Fare Card

2.4.1 Physical Standards

All fare cards shall conform with the following:

- (a) Basic physical standards as defined by the International Standards Organization (ISO) standards 7810 and 7813. Dimensional thickness and physical robustness standards shall not apply to disposable cards, provided that height and width dimensions are met.
- (b) Specific physical standards for contactless integrated circuit proximity remote coupling cards specified in ISO 14443-1 at the time of the Final Design Review. In instances where this emerging standard (ISO 14443) modifies or constrains other ISO standards in order to accommodate the contactless functionality, such modifications shall apply to the fare cards.

2.4.2 Card Memory Storage Capacity

At a minimum, the memory storage capacity shall be sufficient to support all RFCS functions and shall ensure that the card has sufficient memory to store at least two other non-transit applications. Additionally the memory shall be sufficient to store both the TransAp and OpAp applications concurrently.

- (a) The Contractor shall choose and specify the memory capacity of the fare card given the requirements specified herein and according to the Contractor’s analysis of those data and system requirements

including the anticipated addition of RFCS and non-RFCS applications to the card.

- (b) The Agencies reserves the right to use the remaining memory on Agency issued fare cards for purposes not identified at time of Contract award.

2.4.3 Data on the Regional Fare Card

The following minimum data segments shall be provided on the “normal (non-disposable) fare card (DR 101.05):

- (a) Base Segment
- (b) Agency Data
- (c) RFCS Stored Value Purse
- (d) Pass Products (zero or more)
- (e) Multi-ride Products (zero or more)
- (f) Ride History
- (g) Revalue History

The way data is stored on a fare card is not specified.

2.4.3.1 Base Segment (One Per Card)

The base shall consist of the following minimum data fields:

| Data Field | Comments |
|----------------------------------|---|
| Card Serial Number | Regional Fare Card-assigned number |
| Card Expiration Date | Based on life of card |
| | |
| | |
| Passenger Type Indicator | Adult, RRFPP senior, RRFPP disabled, youth and other category |
| Passenger Vehicle Type Indicator | Defines the default vehicle type for WSF vehicle ferry travel (up to 20 different types; 7 types estimated initially) |
| Passenger Type Expiration Date | Required for temporary disabled |
| Cardholder Birth Date | Optional for RRFPP cards or youth |

2.4.3.2 Agency Data (One Segment Per Agency)

Agency-specific data that needs to be stored on the fare card (not required by all agencies).

- (a) This feature shall be transparent to the customer.

- (b) The Agency Data shall consists of the following minimum data fields:

| Data Field | Comments |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | Loyalty meters (as described in the PDR document) will not be stored on the fare card. |
| Customer Zone or Route Fare Preference Preset | Parameter that indicates the customer's preference for number zones of travel in a multi-zone system (e.g. 1, 2 or 3), or WSF route designated by an origin-destination pair. Functionality to be included but implemented per Agency policy. |

2.4.3.3 RFCS Stored Value Purse (One Per Card)

If a card has an RFCS stored value purse, monetary value will be added by the add fare process and subtracted through fare calculations. The RFCS Stored Value Purse shall consist of the following minimum data field:

| Data Field | Comments |
|-------------------------|---|
| | |
| Remaining Value on Card | Current stored value remaining on card. |

2.4.3.4 Pass Products (For Each Pass Type)

A card may be loaded with zero or more passes. Only one pass of the same type may be currently active for an Agency. The Pass shall consist of the following minimum data fields:

| Data Field | Comments |
|-------------------------|--|
| Agency | Agency who issued pass |
| Start Date of Pass | First date for rides |
| Expiration Date of Pass | Last date for rides |
| Type of Pass | e.g. Day Pass, 1 week, 2 week, Monthly, Annual, Employer, Campus, Puget Pass |

2.4.3.5 Multit-Rides

“10-Day Passes (Trips or Rides)” will be stored as Multi-ride Products, rather than 10 individual ride products. This provides additional flexibility for the agencies (allowing 20 ride products, for example) as well as requiring less storage space on the card.

A card may be loaded with one or more blocks of stored rides in the form of multi-ride products.

- (a) The fare card shall include capacity for at least one multi-ride product for each of the participating Agencies.
- (b) Only one multi-ride product of the same type may be currently active per Agency. Multi-ride products on the card shall be in addition to any active passes for the Agency.
- (c) Multi-ride products may be specified to one Agency, or valid across multiple Agencies.
- (d) Each multi-ride product shall include the following minimum data fields:

| Data Field | Comments |
|-----------------|---|
| Agency | Agency who issued stored rides |
| | |
| Remaining Rides | Number of rides remaining in the multi-ride product |
| Expiration Date | Latest date, after which the product is no longer valid |

2.4.3.6 Ride History (Last Ten Rides Per Agency)

Each time a card is tagged for a new ride, a record is created and the oldest record shall be purged.

- (a) The card shall have sufficient capacity to store the last ten (10) transactions system wide.
- (b) The Ride History shall consists of the following minimum data fields:

| Data Field | Comments |
|------------------------------|--|
| Agency Providing Service | Agency providing ride |
| Route/Run/Trip | Route, run, and trip code as applicable to Agency |
| Entry Transaction Location 1 | |
| | |
| | |
| Ride date | |
| FTP Number | FTP ID number |
| Time of Transaction | |
| Amount of Transaction | Amount decremented from stored value of the card for current ride or transfer |
| Transaction Code | Such as: Ride, Reversal, Transfer, Short-payment (fare), Upgrade Fare, Exception, including any combination thereof (for example, pass transaction with stored value upgrade). |
| Terminal Exit Transaction | (Optional) exit FTP ID number |
| Time of Exit | (Optional) |
| Exit Transaction Location | |

2.4.3.7 Revalue History (Last Five Value Adds)

“Revalue History” for all Agencies will be stored in a single, five-record revalue log. Same as the ride history, each time a card is revalued with a new value or pass, a revalue record is created and the oldest revalue record is purged.

The Revalue History shall consists of the following minimum data fields:

| Data Field | Comments |
|-------------------------|--|
| Revalue Type | Initial value, value add, pass, stored rides, adjustment |
| | |
| Revaluing Entity | Agency or Contractor selling value |
| Terminal ID of Purchase | |
| Purchase Date | |
| Time of Purchase | |
| Amount of Revalue | |

2.4.4 Graphic Requirements

All issued fare cards shall conform to a common graphic standard that shall be finalized at the final design review. The Contractor shall propose a graphics scheme which is consistent with the Agency's identity program. The graphics standard shall be finalized at the final design review (DR 101.06). At a minimum, the following elements shall be provided on the card:

- (a) The 8-digit portion of the unique Card Serial Number, which is the portion used for human interface to the System, will be physically printed on the front of the Standard card. This same serial number will be printed on the back of the Campus Card. The full electronic serial number shall be maintained on the card, per applicable ISO standards.
- (b) The serial number placement shall be in conformance with ISO 7811-3, as constrained by ISO 14443-1 such as the last line from top/first line from bottom is unavailable for embossing because of the antenna loop in the card.
- (c) Regional Fare Coordination Project logo.
- (d) Local Agency Customer Service Telephone Numbers shall be placed on the back of the card along with customer service related information.
- (e) Name of the Fare Card Program shall be imprinted on the front of the card.
- (f) An area for a cardholder photo shall be available for post production print, to use on Employer, Campus and/or RRFP cards.
- (g) An area for a company logo shall be available for post production print, for use with Employer and Campus cards.
- (h) Special Graphics shall be provided if the Agencies choose to issue "Collector Cards."
- (i) An area for a magnetic stripe shall be reserved for interfacing with automated teller machines (ATM).
- (j) Card Graphics shall use a minimum of four colors.
- (k) **Option** Signature Panel shall be provided on the back of the card to enable Cardholders to identify to whom the card belongs, or to differentiate one fare card from another.

6.III-2.5 Testing Requirements and Procedures - Fare Card

- (a) The Contractor shall validate through the FAT tests that RFCS cards meet all the Contract requirements for wear, data retention, and interfaces to terminal devices.
- (b) The cards used in FAT shall be RFC production cards representative of those to be used in the operational RFCS.

6.III-2.6 Security Requirements - Fare Card**2.6.1 Chip Personalization**

The Contractor shall perform chip personalization during the card issuance in the presence of a secure access module (SAM) or another smart card, which would hold the encryption key(s).

2.6.2 Privacy

Each card application shall be protected with a security key that will enable only the owner of the application to view the contents of the application information stored on the card. Information pertaining to a particular application shall not be accessible by the card issuer or the owners of any other application residing on the card.

6.III-2.7 Agency or Institution Specific Requirements - Fare Card**2.7.1 Sound Transit**

The RFCS Contractor shall support Sound Transit fare collection equipment contractor with integrating the RFCS application on existing fare collection equipment. The RFCS contractor shall, under the cooperation of Sound Transit, develop the necessary RFCS software that will be loaded onto Sound Transit equipment. It is anticipated that software will be required for card to reader interface and CDCS to clearinghouse.

2.7.2 Campus Card Model (University of Washington Husky Card)

The following requirements shall apply to Campus Cards (DR 101.07), specifically to the UW Husky Card. These requirements may also apply to large institutional organizations.

2.7.2.1 Card Imprinting Requirements

The face of each card shall include space for the following university or college-specific imprinted information:

- (a) University or college logo

- (b) “Non-Transferable Property of {university or college name}”
- (c) Cardholder name
- (d) Classification of cardholder such as Staff, Faculty, Student or Affiliate
- (e) Capability of being imprinted with up to four colors
- (f) For student cards only, “Misuse Penalty WAC 478-120 Student Conduct Code”
- (g) Cardholder photo

2.7.2.2 Magnetic Stripe Husky Card

- (a) Cards will be issued with an ABA standard high coercivity magnetic stripe (unencoded at issuance) on the reverse side.
- (b) The stripe shall be a maximum .218 in. from top edge of card to tip edge of magnetic stripe. Bottom edge of magnetic stripe no less than .020 in. from the bottom line of the last track encoded.
- (c) The Signal Output level of all stripes must be equivalent to 80%-130% of ISO standard output level specified for 2700-4000 Oersted stripes (as referenced in ISO Specifications 7811-6).
- (d) The magnetic stripe shall be capable of passing a test to encode UW information and then reading the information in several different types of readers on campus.
- (e) The magnetic stripe is to be used for campus applications. Use of the stripe for other applications or purposes is subject to approval by the Contract Administrator and the University of Washington.

2.7.3 WSF Commercial Account Card

- (a) A Commercial ID filed will be added to the Standard Card.
- (b) The Commercial ID will be fixed and not modifiable when the Commercial Account Agreement is approved.
- (c) The Commercial ID will be set when the card is issued through a Commercial account Card Order and will not be modifiable once set.
- (d) The Commercial Account Name will continue to be displayed as it is currently at the websites and CST.
- (e) No ERG device will display the Commercial Account ID.

(f) The GAK will make the Commercial Account ID available to the WSF Electronic Fare System (EFS).

(g) There will be no Reporting impacts.

6.III-3 GENERAL REQUIREMENTS FARE TRANSACTION PROCESSOR (FTP)

The requirements stated in this Section shall apply to all configurations of fare transaction processors supplied under this Contract as described in Section 6.III-4, 6.III-8 and 6.III-9; but also, as applicable, to the related modules described in Section 6.III-6, 6.III-7 and 6.III-10.

6.III-3.1 Subsystem Description - FTP

The FTP (DR 102) is the region's fare collection device for the RFCS. The basic functionality of all FTPs is essentially the same, only the physical packaging is customized for the environment in which it will be used. In addition to collecting fares and validating passes, the FTP shall:

- (a) Store transaction history
- (b) Check for blocked cards
- (c) Perform automated revalue
- (d) Dump all transaction data to the Wireless Data On/Off Loading System, if directly connected, when a data transfer is initiated.

3.1.1 FTP Configurations

The Contractor shall provide the following FTP configurations that will read the data on the fare card, process the corresponding transaction, write the correct data back to the fare card, and transfer the transaction records to the appropriate data acquisition computer (DAC) or directly to the clearinghouse system:

- (a) On-Board FTP (OBFTP) – will be used by all Agencies except WSF to process fare transactions aboard buses (Section 6.III-4.)
- (b) Portable FTP – are small, hand held devices used in applications where the installation of fixed equipment is impractical or unnecessary. Examples include vanpool and paratransit applications, WSF operations at selected terminals, and potentially on-board commuter and light rail vehicles or at stations. (Section 6.II-8).
- (c) Stand-Alone FTP – are used primarily in the Sound Transit and WSF environments in locations where a fixed, stationary device is appropriate. Rail Platforms and Ferry Docks will have multiple stand-alone FTPs which will enable passengers to tag the FTP associated with their destination (Section 6.III-9.)

3.1.2 FTP Configuration Requirements

All FTP configurations shall include the following elements that are described in the subsequent Subsections:

- (a) Central Processing Unit
- (b) Memory
- (c) Smart Card Interface
- (d) Customer Interface
- (e) Hardware Interface

6.III-3.2 Functional Requirements - FTP

The following general FTP functional requirements apply to all configurations of FTPs.

3.2.0 Central Processing Unit

The FTP central processing unit shall be capable of supporting, at a minimum, the following functions:

- (a) Prior to use for fare collection or customer service, the FTP shall initialize itself and accept log-on from Agency Personnel.
- (b) The FTP shall provide functionality for the following methods of log-on:
 - i. Manual entry/update of log-on information through the DDU keypad for On-Board FTPs, keypad entry through Portable FTPs, and on-line and laptop connection to Stand Alone FTPs. Manual log-on and en-route log-on/updates shall not require the use of a smart card.
 - ii. For on-board FTPs, transfer of log-on information from a driver ID card. For Stand Alone FTPs, log-on information shall be transmitted through the communications network.
- (c) Specific data to be entered/uploaded for log-on will vary by agency and will be defined at Conceptual Design Review (CDRL 1). As a minimum, FTP log-on data fields shall include:
 - i. Fareset
 - ii. Trip Number
 - iii. Route Number
 - iv. Run Number
 - v. Operator ID

- vi. Capability of accommodating minimum two additional fields (to be defined for each Agency as part of CDR)
- (d) The Contractor shall be responsible for developing interfaces in the RFCS capable of accepting ASCII files of log-on data from Agency run cutting and scheduling systems, tied to Operator ID, for the purpose of upload through the RFC system. The Agencies will be responsible for providing the format and content of the data and identifying the run cutting and scheduling system to be used at Conceptual Design Review (CDRL 1). The Agencies will also be responsible for modifications to legacy systems to support data export and interface to the RFCS.
- (e) Upon reading a card for fare payment, the FTP shall:
 - i. Indicate if the card is valid. A blocked or improper card shall trigger a red light on the customer display and an audible warning.
 - ii. Display the fare to be deducted and fare basis (e.g. "1 Zone Fare"). The fare basis display is required if the Cardholder has a Zone Fare Preset established on the card.
 - iii. For the Sounder Stand Alone and Portable Fare Transaction Processors, also display the Station of Origin, fare paid and change the screen that displays "Permit to Travel 2 Zones" to display station of origin and fare paid.
 - iv. If additional fare is required, display the additional amount.
 - v. Make the appropriate deduction, considering any discounts applicable, and update any appropriate trip counting data fields.
 - vi. Display the remaining value on the card and display an indication of special fare or pass type, if used, and any frequency discount which has accrued.
- (f) The FTP shall store and process the transaction data for upload to the DAC.
- (g) Using displays, light indicators, and audio tones, the FTP shall provide operator and customer feedback for each transaction.
- (h) The FTP shall maintain collected transaction data in the event of a device, interface, or power failure.
- (i) The Contractor shall provide a method to ensure the integrity of the data on the OBFTP until a successful data exchange with the WDOLS is acknowledged.
- (j) The FTP shall store and process a minimum of two (2) fare tables: Current and those for the next fare or service change. Fare tables shall contain data for a minimum two (2) Agencies, with the active table determined by the transit service the coach is operating under.

- (k) The FTP shall automatically implement fare table transitions for scheduled fare changes, holiday fare tables, etc.
- (l) The FTP number, agency owning coach, coach number, and service operated under shall be parameters that are retained in the FTP unless modified by the system administrator/manager.

3.2.1 Memory

3.2.1.1 Capacity

- (a) The FTP shall use solid state memory with sufficient capacity to store at a minimum, all data subsequent to the last data upload to the DACS including:
 - i. Up to 10,000 transaction records.
 - ii. 100 log-in / log-off records.
 - iii. 100 Event records such as, but not limited to FTP malfunctions, failed read attempts, successful and unsuccessful data up- and down-loads.
 - iv. 6,000 bad card numbers for cards issued to the general public.
 - v. Card block or status change information for all campus and other institutional cards in circulation (capacity is required to update the status of all campus cards at an academic quarter or semester change, and also to update non-campus institutional account cards).
 - vi. Secret keys for communication and card access.
 - vii. Manager passwords.
 - viii. Minimum of two (2) fare tables.
 - ix. Automatic card revalue information.
 - x. Vehicle identification number or designated location code to be programmed at time of installation.
 - xi. Additional Agency specific data required for processing and reporting local fares and inter-service transfers.
- (b) As transaction volumes increase, FTP memory shall be expandable to a capacity of at least five times that for previously listed items i. through xi.
- (c) The Contractor shall provide data storage for the OBFTP which uses non-volatile memory.

3.2.1.2 Captured Ride Data

Ride data is captured in the FTP when cards are tagged by customers. The data is recorded in groups, called intervals. Using the data fields identified below and additional fields if necessary, the FTP shall capture and/or generate the following data.

(a) Transaction Header Data (for each recording interval)

Each interval shares common header data, which applies to each transaction in the group. An interval may represent one direction of a route (e.g. inbound or outbound or ferry route destination), an individual vehicle stop, change in log-on or route/run/trip parameters, or it may represent a period of time at a fixed location. An example of the possible transaction header data is subsequently shown.

| Data Field | Comments |
|---------------------------------------|--|
| Agency Owning Coach | The agency who owns the coach and FTP. |
| Coach Number/Designated location code | |
| FTP Number | |
| Driver/Seller/Attendant Log-on | |
| Service Operated Under | Community Transit and King County coaches may be operated as Sound Transit contracted service, and/or a private contractor may operate as an Agency service. |
| Fareset | The fareset in effect |
| Transaction Location 1 | Station 1 or Ferry Terminal |
| Transaction Location 2 | Station 2 (if applicable), Route or Vehicle Stop |
| Route | Route number as applicable to each Agency. |
| Run | Run number as applicable to each Agency. |
| Trip | Trip number as applicable to each Agency. |
| Service date | |
| Time of Interval Start | |

(b) Transaction Detail (for each captured ride transaction)

The Transaction Detail shall capture and include the data fields listed in Section 2.4.3.1 through 2.4.3.6 (current ride only) in each transaction. The Transaction Detail shall also include the following additional data fields in each transaction.

| Data Field | Comments |
|--------------------------------|----------|
| Driver/Seller/Attendant Log-on | |
| FTP Number | |
| Date of Transaction | |

| | |
|---------------------|--|
| Time of Transaction | |
| FTP Transaction ID | Transaction sequence number generated by FTP |

The following set of data fields shall be provided but requires fare policy decision for activation.

| Data Field | Comments |
|---------------------------|-------------------------------------|
| | |
| Terminal Exit Transaction | Optional by Agency, exit FTP ID |
| Time of Exit | Optional by Agency |
| Exit Transaction Location | Optional by Agency, e.g. GPS or AVL |

3.2.2 Smart Card Interface

The FTP contactless interface shall meet ISO 14443, parts 2 and 3, and shall be in conformance with its most recent release at the time of contract execution. Where available from the card manufacturer, the FTP contactless interface shall meet ISO 14443 part 4, and shall be in conformance with its most recent release at the time of contract execution.

- (a) Power and Signal Interface Standards — The Contractor shall conform to the standards for contactless cards specified in ISO 14443-2.
- (b) The FTP shall have a communications signal interface that conforms with both ISO 14443-2 Type A and ISO 14443-2 Type B standards (DR 102.01).
- (c) Initialization and Anti-Collision Protocol
 - i. The card and FTP shall accommodate an anti-collision protocol preventing erroneous processing when more than one card is simultaneously brought within the processing range of the FTP.
 - ii. The initialization and anti-collision protocols shall conform to the specifications of ISO 14443-3.
 - iii. In the absence of such a protocol, the Contractor shall propose a standard subject to Contract Administrator approval.
 - iv. **Optional:** Through operator intervention, such as holding down a designated button, an FTP shall be able to process a stack of up to five (5) fare cards. This feature is of interest to Washington State Ferries to support vehicle-level operations where multiple cards may be presented simultaneously. This manual override of the anti-collision

protocol shall be subject to the review and approval of the Contract Administrator.

- (e) The fare card transaction protocol shall conform to the specifications of ISO 14443-4, subject to a compliant interface being provided by the card manufacturer.
- (f) Operating Range
 - i. The card and FTP shall interface within the distances and relative orientations defined in ISO 14443.
 - ii. RFCS equipment read-write distance shall be adjustable from zero to the maximum defined in ISO 14443.
 - iii. The distance shall be optimized once the system is in operation.

3.2.3 Customer Interface

The Contractor shall provide a customer interface and display (DR 102.02) to provide the customer with transaction status information as follows:

- (a) Message indicating the FTP is not operational such as, “OUT OF SERVICE”.
- (b) The Contract Administrator will define the message sets and formats with the Contractor during the design review process.
- (c) The message sets shall be finalized after the Beta Test program has been completed.
- (d) Display messages shall be easily edited on an as needed basis, once the system is in operation.
- (e) At a minimum, the following messages shall be provided:
 - i. Default or idle message to indicate the system is operational such as, “READY.”
 - ii. Fare type and amount deducted.
 - iii. Remaining value on the card. Activation of this feature for Full System Rollout shall be finalized after completion of the Beta Test program.
 - iv. Indication of an unsuccessful transaction with reason such as, “Invalid read/encode – try again,” “Insufficient value,” “Invalid card – Call Service Center.”
 - v. Indicator that the card has a low remaining value such as “low value.”

- vi. Message sets customized according to inter-Agency transfer agreements and fare policy.
- (f) The display menu and display messages shall be programmable using a developer's utility, supplied by the Contractor, running on a Windows-Intel PC with the capability to upload the modified menu or messages to the FTP using a standard PC port.
- (g) The messages and displays shall also be modifiable from a central location.

3.2.3.1 Light Indicator

- (a) The FTP shall be equipped with transaction status indicators visible to the customer.
- (b) These indicators shall consist of a "Green-, Yellow-, and Red-Light" to indicate a successful or unsuccessful transaction.
- (c) This feature augments the alpha numeric display. Figure III-3.1 summarizes customer visual indicators.

3.2.3.2 Audio Indicator

- (a) An audio feedback for indicating the completion of a successful or unsuccessful transaction shall be also be provided.
- (b) The audio indicators shall be different sounds or different volume levels of the same sound.
- (c) The FTP sound level shall be controlled with a minimum number of keystrokes or adjustments by the operator of the relevant FTP.
- (d) The type of audio feedback and the parameters are subject to Contract Administrator approval. Figure III-3.1 summarizes customer audio indicators.

**Figure III-3.1
CUSTOMER INDICATOR MATRIX**

| Condition | Visual Indicator | Audio Indicator |
|--|------------------|-----------------|
| Successful Transaction | Green | Indicator 1 |
| Warning - i.e. low card value | Yellow | Indicator 2 |
| Incomplete or failed read | Yellow Flashing | Indicator 3 |
| Unsuccessful Transaction - i.e. insufficient value, expired pass, blocked card | Red | Indicator 4 |

6.III-3.3 Performance Requirements**3.3.1 Processing Time**

The processing of a transaction shall be completed within 0.3 seconds (300 ms). The following shall be concluded within this time frame:

- (a) Initialization;
- (b) Authentication and other security processes;
- (c) Data Exchange (read and encode);
- (d) Computation of fare, including applicable incentives or discounts;
- (e) Initiate the display of results on the customer (and any other applicable) displays. Once initiated, the results shall be displayed within an additional 250 ms on the customer (and any other applicable) display.

3.3.2 Accuracy and Reliability

- (a) Accuracy for all types of FTPs is defined as the mean ratio of the number of transactions correctly recorded by the FTP, as evidenced by the transactional data recorded and stored on the fare card, to the number of transactions attempted.
- (b) As part of Factory Acceptance Testing (Section 6.II-11.4.2) and Acceptance Testing (Section 6.II-11.4.7), the Contractor shall demonstrate a minimum FTP transaction processing accuracy rate of 99.99% as identified in Item (a) above.
- (c) The FTP shall have a minimum reliability of 30,000 MOHBF for each type of FTP configuration.
- (d) Any single FTP that fails more than two (2) times per month as a result of Type II failures as defined in Section 6.II-11.4.8.7.2, subsections iii, iv and v, shall be replaced with a new unit. If the new unit experiences the same failure rate, the Contractor shall be responsible to initiate an investigation to determine why the unit fails, and then shall perform repairs, or redesign the unit as necessary and replace the existing units with the redesigned units.

6.III-3.4 Physical Requirements

3.4.1 Appearance and Styling

- (a) Each type of FTP shall conform to generally accepted practices in appearance and styling, within the limitations of materials used for construction, and shall be approved by the Contract Administrator at the Preliminary Design Review. (DR 102.03)
- (b) All exterior surfaces shall be clean with all corners rounded.
- (c) There shall be no exposed bolt heads, nuts, sharp edges, or cracks on the outside surfaces.
- (d) All displays shall be flush mounted in the enclosures.

3.4.2 Structural Features

- (a) The finish shall be orbital finished stainless steel, unless specified otherwise or approved by the Contract Administrator. The following changes have been approved by the Contract Administrator:
 - 1) The DDU and OBFTP will be manufactured from injected molded plastics.
 - 2) The finish of the SAFTP will be non-ferrous bead blasted.
- (b) Provisions shall be incorporated to clear any liquids that may enter the device or condensation that may develop.

3.4.3 Customer Display

- (a) The display shall be water and liquid resistant.
- (b) Any leakage into the unit shall not cause the unit to become non-operational.
- (c) The display technology shall be subject to Contract Administrator approval and shall meet the following requirements:
 - i. Readable under any combination of ambient lighting such as direct sunlight and night-time operation;
 - ii. At least two lines of alpha-numeric text with a minimum of twenty characters readable from 6 feet.
- (d) The display shall resist breakage due to accidental impact from hard objects, such as briefcases, during boarding, wheelchair handles or other devices used by the disabled community.

- (e) WSF will require two customer displays at vehicle toll booths. Both displays shall show the same messages simultaneously.

3.4.4 Locks and Security

- (a) Access cover(s) of the FTP housing shall be opened with mechanical key(s) for maintenance access to the modules and subassemblies.
- (b) The key(s) shall be of a type that is not readily duplicated and stamped with the words "NO COPY".
- (c) Alternative means of securing the internal components shall be subject to Contract Administrator approval.
 - i. The DDU and OBFTP housings shall be secured to the cradle with inaccessible tamperproof screws or similar fasteners. Each device shall mechanically lock to its cradle.
 - ii. The SAFTP will be secured through a mechanical lock on the rear access door of the unit.
 - iii. The PFTP will not be secured.

3.4.5 Identification Labels

- (a) A metal identification label inscribed with the FTP serial number shall be permanently attached to the outside of each FTP housing.
- (b) Major subassemblies inside the FTP shall have a permanently attached label inscribed with a unique serial number and part number prominently located on the subassembly.

3.4.6 Modularity

- (a) The FTP shall be packaged as a separate unit and not bundled with the DDU, WDOLS or Ethernet hub.
- (b) The FTP shall use connectors, approved by the Contract Administrator, for all external connections.

6.III-3.5 Environmental Requirements

The FTPs and related modules (including the Ethernet hub) shall be designed to comply with all applicable FCC regulations concerning conducted and radiated emissions of RF energy and shall operate in the environmental conditions provided in Figure III-3.2.

Figure III-3.2
FTP OPERATING ENVIRONMENT

| Parameter | Minimum Requirement |
|--|--|
| Temperature Range: | +10°F to +110°F operating; -25°F to +150°F storage |
| Thermal Shock: | Per SAE J1455 (Jan 88) Section 4.1.3.2 |
| Thermal Cycle: | Per SAE J1455 (Jan 88) Section 4.1.3.1 |
| Humidity: | 20% - 90% relative humidity, non-condensing |
| Shock: | Up to 5g instantaneous and horizontal |
| Vibration: | 1.5g (RMS), 5 to 200 Hz |
| EMI Susceptibility: <i>Example sources: Heater and air conditioning controls, high voltage arcs, alternators, radar and radio from WSF operations, etc.</i> | Per the requirements of 6.III-1.7.1(h). |
| Other (dust, grit, rain- and salt water protection): | The FTP and associated devices shall have the following minimum ratings against the ingress of dust, grit and water: Onboard FTP (6.III-4), Driver Display Unit (6.III-6), Ethernet Hub (6.III-11) and Radio Control Unit (6.III-6.8.3): IP 44 Wireless Data On/Off Load System (6.III-7): IP 42 rating in its installed configuration, to be confirmed at Final Design Review. Stand Alone FTP (6.III-9): IP 55 Portable FTP (6.III-8): IP42 The Stand Alone FTP shall include additional protection to prevent salt water ingress and corrosion when installed in a marine environment (e.g. for WSF). This shall include protection against direct salt water spray. |

6.III-3.6 Data Exchange Requirements

All software and fare table updates shall be uploaded through the RFC system, and shall not require manual data upload from a laptop computer, memory card, disk or other means.

The FTP clock shall be synchronized via the DACS clock. Synchronization shall occur during data on and off loads.

3.6.1 Communication Ports

- (a) The FTP shall include as a minimum the following ports:
 - i. A high speed serial port to provide the primary data connection to the FTP.
 - ii. An RS232 port for diagnostics and back-up data transfer.

- (b) The Contractor shall provide a Communications Interface Specification (DR 102.04) for the FTP. This specification shall include a description of the data elements and communication protocols for all ports.
- (c) The Communications Interface Specification shall also describe the data elements and communications protocols for any additional communication ports required by specific FTP configurations per Sections 6.III-4, 6.III-8, and 6.III-9.

3.6.2 FTP Back-Up System

- (a) The Contractor shall provide an alternate means of extracting data from the FTP, such as via a laptop computer, subject to Contract Administrator review and approval.
- (b) The backup system shall be used primarily to upload captured transaction data from the FTP.
- (c) It shall be possible to manually upload/download data files in the event of a primary data path failure through an RS232 port.
- (d) In the event of a primary data storage failure or backup battery failure, an indication on the display shall alert the operator.
- (e) Correct password entry shall automatically enable the FTP to download the transaction data to the back-up device.
 - i. Neither the FTP nor the backup device shall retain the correct password.
 - ii. Unsuccessful attempts to enter the password shall be logged at the FTP.
 - iii. The log shall contain detailed information including, the date, time, location, FTP number, and erroneous password.
- (f) An alternate process for initiating data extraction may be provided which shall be subject to Contract Administrator review and approval.
- (g) Alternate means of removing data records may be provided.
 - i. The Contractor shall provide a detailed description and the technical details necessary for Contract Administrator evaluation.
 - ii. Alternative means of data removal are subject to Contract Administrator approval.

- (h) If the FTP is removed for depot maintenance, the backup method shall upload captured transaction data to a depot DAC or to the clearinghouse.

6.III-3.7 Testing Requirements and Procedures - FTP

In addition to testing specified in Section 6.II-11.4 “Testing Requirements” the following tests shall be performed.

3.7.1 Cycling Test

Cycling test for each type of FTP shall be performed as follows on the first unit representative of the production units.

- (a) A minimum of 10,000 transactions, and at least 500 data downloads and 200 fare table up-loads shall be conducted.
- (b) Transactions shall be divided evenly among all possible fare deduction and Agency transfer transactions of which the device is capable.
- (c) The fare amounts shall be representative of those expected to be employed in the RFCS. Detailed information regarding the transaction types and values to be used in the cycling test shall be included in the Detailed Test Procedures and subject to Contract Administrator approval.

3.7.2 Vibration Test

The Contractor shall ensure that all vehicle fleet vibration conditions expected in the area of equipment installation are taken into account to ensure that proper isolation/protection is built in to the design of equipment that may be used in an on-board environment to accommodate the range of frequencies anticipated for the vehicle fleet. The following requirements shall be met.

- (a) The FTP components shall be tested per the procedure of *MIL-STD-810C, Method 514.2, Category f, Curve V (1.5g, 5.5 to 200 Hz)* with the following changes:
 - The cycling time shall be two (2) hours on each axis for a total of six (6) hours. The equipment shall operate normally during and after this acceleration test, and shall not experience broken or loosened parts from this vibration.
 - At the conclusion of each axis frequency sweep cycle, the equipment shall be subjected to a vibration of three (3) g-forces at a frequency sweep between seven (7) and fourteen

(14) Hz for a period of one (1) minute and four (4) g-forces at a frequency sweep between seventy (70) and one hundred and forty (140) Hz for a period of one (1) minute. The equipment shall operate normally after these acceleration tests and shall not experience broken or loosened parts from this vibration.

3.7.3 Shock Test

The FTP equipment shall be tested per *Procedure I of MIL-STD-810C* with the following changes:

- (a) The half sine shock pulse shall have a peak value (A) of 5g and a duration (D) of 20 milliseconds.
- (b) The on-board equipment shall operate normally after the shock tests and shall not have experienced broken or loosened components as a consequence of these tests.

6.III-3.8 Additional Security Requirements - FTP

The Contractor shall provide a means to prevent unauthorized tampering with a stolen or lost FTP and Related Modules.

- (a) The Contractor shall design the FTP to prevent unauthorized recovery of electronic value stored in the memory, or “reverse engineering” which would compromise the RFC system security.
- (b) Upon loss or disconnection of power, the FTP shall securely power down and retain all data.
- (c) Each type of FTP shall be provided with a non-volatile memory for storage of the data files for at least 72 hours as described in the System Backup Plan (CDRL 5).

6.III-4 On-Board Fare Transaction Processor (OBFTP)

6.III-4.1 Subsystem Description - OBFTP

The Contractor shall provide On-Board Fare Transaction Processors (OBFTP) allowing fare cards to be read and encoded through the contactless interface during the fare payment process on-board Agency coaches. The OBFTP shall consist of a CPU for processing transactions, memory for storing fare tables and transaction records, customer display, and card reader (DR 102.05).

The OBFTP shall be capable of operating, when delivered, in a limited integration mode or as a plug-n-play peripheral (full integration mode) on an on-board network to be provided by others. Initially, the Agencies expect to operate the OBFTPs with a limited degree of integration, and then migrate to a full integration mode when an on-board Vehicle Logic Unit (VLU) is developed and installed by others (see Section 6.III-5).

A flexible architecture for the OBFTP (DR 102.06) and DDU is required to allow each agency to migrate from the limited integration mode to the full integration mode at any time in the future, and to accommodate on-board integration requirements and architectures that vary by Agency. The OBFTPs, when delivered, shall be capable of supporting the following two modes of operation, and shall be designed to allow migration from limited to full integration mode without hardware or operating/RFCs application software changes, except such hardware and software changes as necessary to achieve the objectives of Change Order No. 32.

The Ethernet switch will be installed as per Section 6.II-11.3 for the purpose of providing an environment that allows for developing a modular on board architecture as per contract clause 6.III-3.4.6. When installed, the Ethernet switch will function as the communications switch for all on-board system traffic for fare collection purposes. The Ethernet switch shall provide communications between the OBFTP, DDU, and VLU at an Agency's discretion, shall transfer data to the WDOLs via an Ethernet switch/High Speed serial interface when communicating on and off the vehicle in FIM.

4.1.1 Limited Integration Mode (LIM)

In the Limited Integration Mode, the OBFTP shall store transactions until communication with the WDOLS is established and data transfer can be completed. The OBFTP shall connect to other on-board devices as illustrated in Figures III-4.1 and III-4.2.

Figure III-4.1 (KCM)

On-Board LIM Architecture for KC Integration

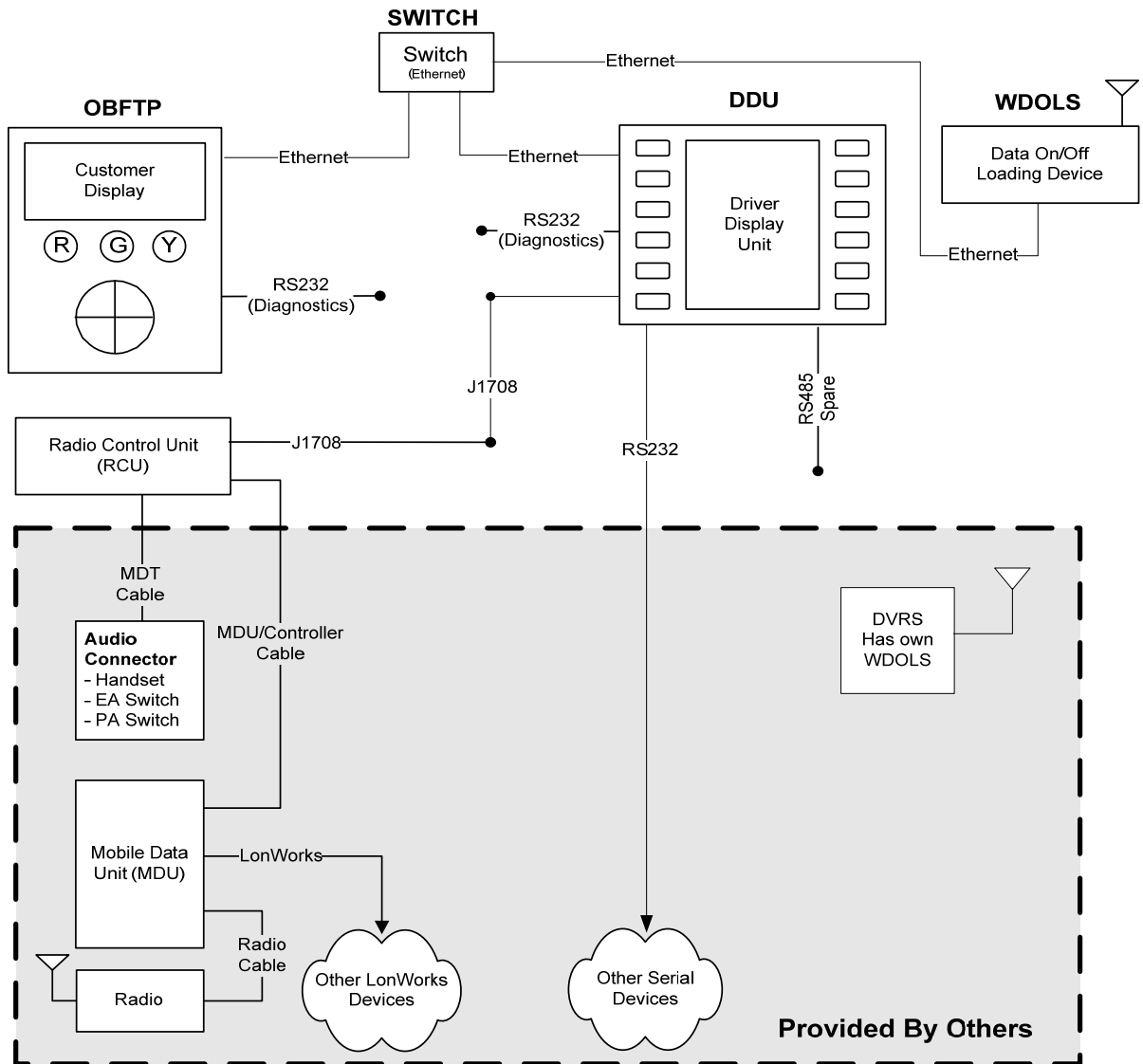


Figure III-4.2 identifies the module interfaces that apply to the Limited Integration Mode (LIM).

Figure III-4.2
MODULE INTERFACE SUMMARY - LIM

| Module | Ethernet Switch | Radio Control Unit | GFI Farebox (Option) |
|---------------|----------------------------|---------------------------|-----------------------------|
| OBFTP | Ethernet/High Speed Serial | N/A | N/A |
| DDU | Ethernet/High Speed Serial | J1708 | N/A |
| WDOLS | Ethernet/High Speed Serial | N/A | N/A |
| VLU | N/A | N/A | N/A |

4.1.2 Full Integration Mode (FIM) – King County

In the Full Integration Mode, the VLU, DDU and the OBFTP shall share the use of the WDOLS for coaches owned or operated by King County. When communication is established via the WDOLS, then the data transfers for each device will be handled in parallel until all are completed. The OBFTP, DDU and WDOLS shall be connected as illustrated in Figures III-4.3 and III-4.4.

The Ethernet switch shall act as the interface between the OBFTP, DDU and VLU. The VLU shall send data and information as described herein to the DDU. The DDU will share the information from the VLU with the (AFC Application) by use of the DDU Common Store. An Ethernet/High Speed Serial interface shall be used for on/off-loading data via the WDOLS. Data provided by the VLU will include the variables described in Section 6.III-6.8.4, including but not limited to: login data (route/run/trip), trip change prompts, fareset changes and, if the ERG option exercised, Stop ID data. The AFC Application will update the Common Store variables needed by the OBS, including but not limited to: operator login and default trip fareset.

Figure III - 4.3 (CT)

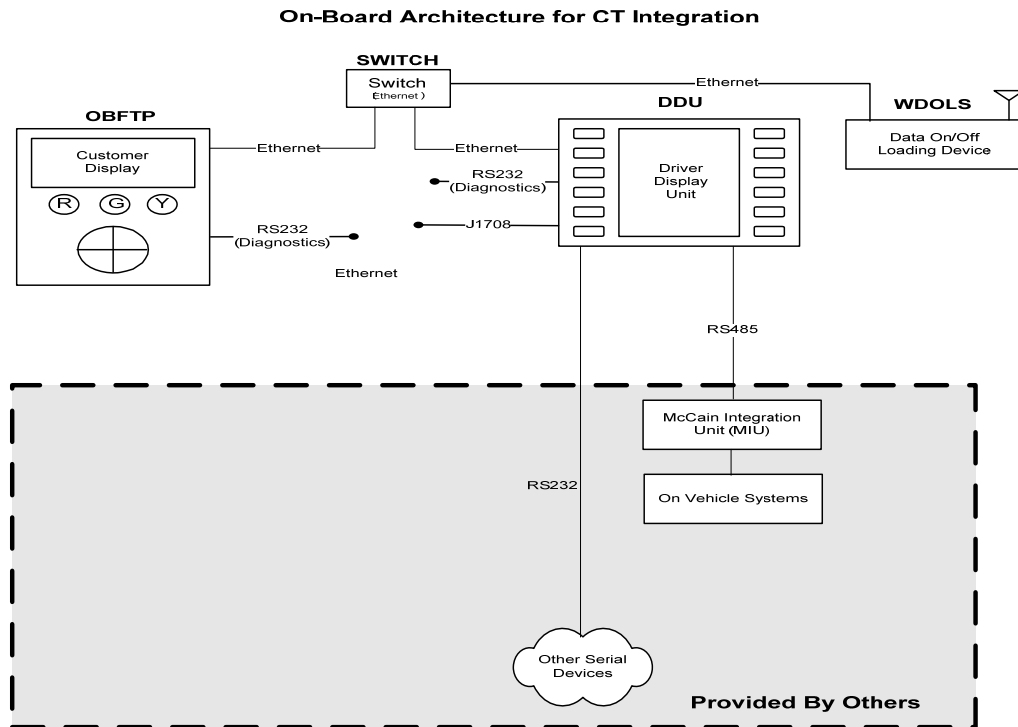


Figure III - 4.3 (PT/ET/KT)

On-Board Architecture for PT, ET, and KT Integration

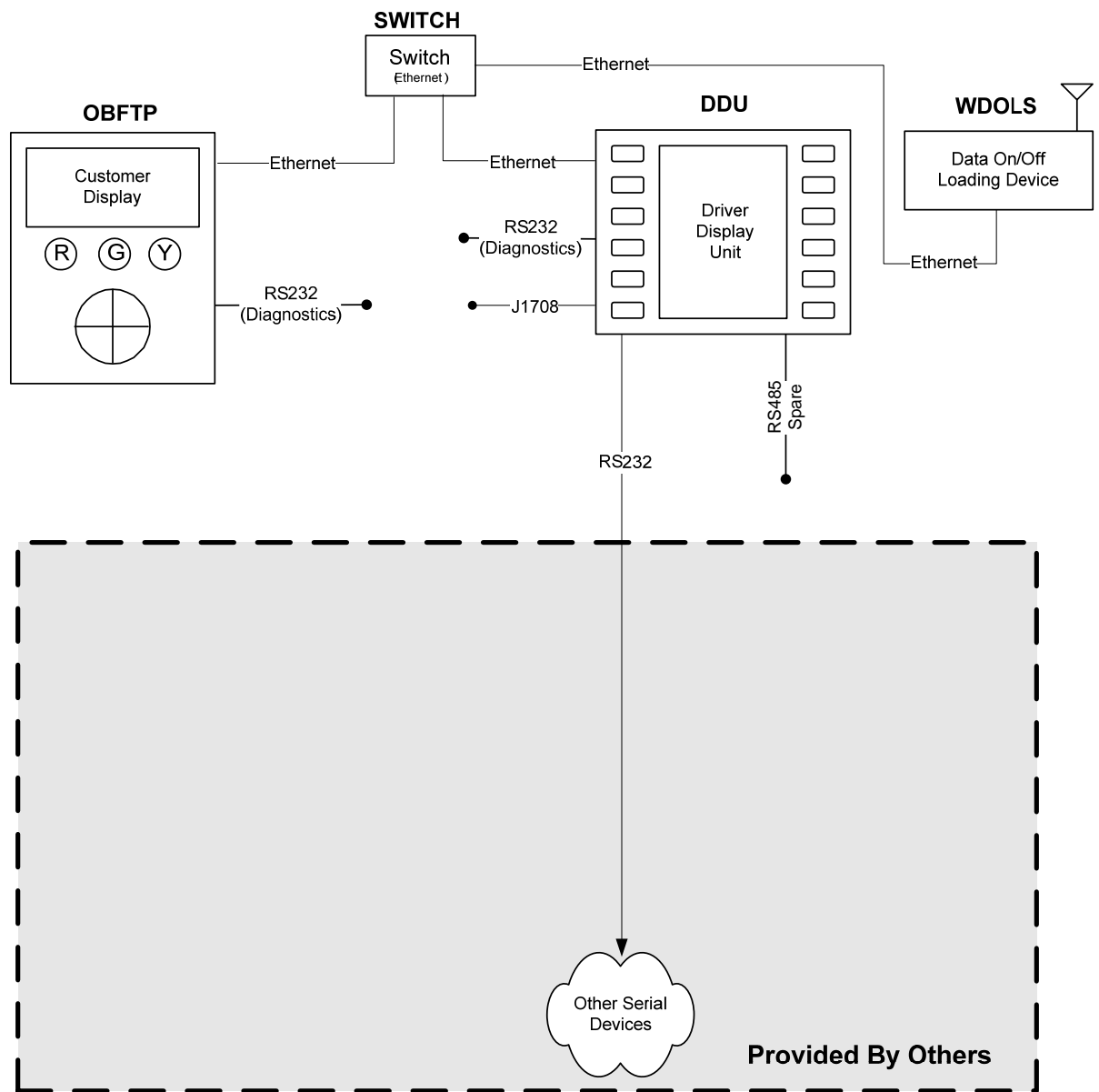


Figure III - 4.3 (KCM)

On-Board Architecture (FIM) for KCM Integration

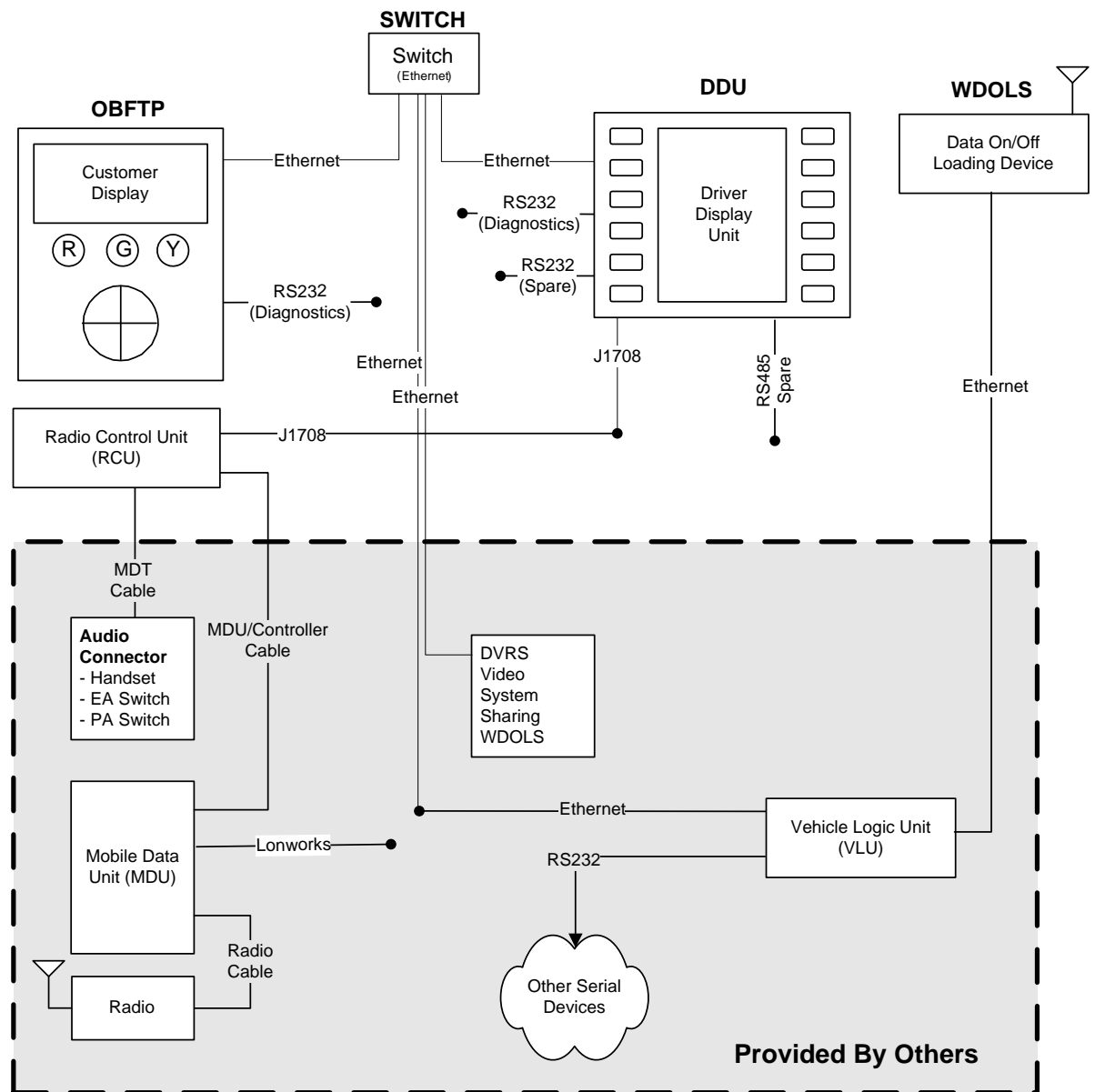


Figure III-4.4 identifies the module interfaces that apply to the Full Integration Mode (FIM). The Contractor may suggest alternative on-board configurations in addition to the configuration provided, subject to the review and approval of the Contract Administrator.

Figure III-4.4
MODULE INTERFACE SUMMARY – FIM

| Module | Ethernet Switch | Radio Control Unit | GFI Farebox (Option) |
|--------|----------------------------|--------------------|----------------------|
| OBFTP | Ethernet/High Speed Serial | N/A | N/A |
| DDU | Ethernet/High Speed Serial | N/A | N/A |
| WDOLS | Ethernet/High Speed Serial | N/A | N/A |
| VLU | Ethernet/High Speed Serial | N/A | N/A |

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6.III-4.2 Functional Requirements - OBFTP

The following functional requirements supplement those stated in Section 6.III-3.2.

- (a) The OBFTP shall accept driver input through the Driver Display Unit (DDU) for security, data collection, and operational purposes.
- (b) The OBFTP shall transfer data to and from the DAC via a wireless off/on loading system, Section 6.III-7.
- (c) The OBFTP shall include capabilities to accept and transfer to the DDU log-on data (driver ID, and initial route, run, block, trip, starting fareset and other log-on data) from a driver smart card.

6.III-4.3 Performance Requirements - OBFTP

The following performance requirements supplement those stated in Section 6.III-3.3.

- (a) The placement of the OBFTP shall promote an accelerated throughput of passengers.
- (b) The minimum throughput rate for OBFTP shall be 30 passengers per minute.
- (c) The throughput rates assume passengers familiar with system operation with a valid fare card, no mis-reads or cards with insufficient value, and no automatic revalue.
- (d) The Contractor shall conduct a human factors analysis with regard to the placement of the OBFTP and confirm the results of the analysis through the human factors test in accordance with Section 6.II-11.4.1.

6.III-4.4 Physical Requirements - OBFTP

The following physical requirements supplement those stated in Section 6.III-3.4.

4.4.1 Dimensions and Layout

A prototype of each OBFTP configuration and its mounting (DR 102.07) shall be demonstrated at time of PDR on each Agency bus type mounting location. Access to the vehicles will be coordinated through the Contract Administrator.

4.4.2 Structural Features

- (a) All on-board equipment provided under this contract shall resist shocks equal to 5.0g without permanent deformation or failure of mounts or diminution of operational characteristics of any subsystems.
- (b) The OBFTP enclosure shall be stainless steel or approved alternative subject to the approval of the Contract Administrator.

6.III-4.5 Electrical Requirements - OBFTP

Equipment installed on-board transit vehicles shall meet the following power supply requirements:

- (a) Nominal voltage: 12 to 24 volts DC nominal (car or bus battery)
- (b) Operating range: 9 to 39 volts DC
- (c) Equipment shall be able to withstand sustained voltage levels of up to 48 VDC for up to ten (10) minutes.
- (d) Equipment shall not suffer damage or lose data in memory when the supply is increased to 48 VDC.
- (e) Equipment shall not suffer corruption of data when the power dips below 9 VDC.
- (f) Equipment shall not be damaged by very high (twenty [20] times nominal voltage) short duration (up to ten [10] milliseconds) peak voltage.
- (g) Contractor shall indicate full operational and quiescent power drain for each on-board module proposed.

6.III-4.6 Data Exchange Requirements - OBFTP

The following data exchange requirements supplement those stated in Section 6.III-3.6.

- (a) To the extent possible, data communications between the OBFTP and other on-board devices shall comply with the applicable Transit Communications Interface Profiles (TCIP) standards that are in effect at the time of Notice to Proceed.
- (b) Communications between on-board devices shall be as described in Section 6.III-4.1.
- (c) The Contractor shall provide the drivers and the interface software for the OBFTP, and shall provide an interface specification for future connection to a VLU.
- (d) The OBFTP shall include a diagnostic port and have the capabilities to allow configuration changes and system maintenance activities to occur through the use of a laptop computer. Any configuration changes and/or system maintenance activities conducted shall be accounted for in the FTP memory and a record shall be transferred to the clearinghouse during the next fare card transaction data transfer.
- (e) The OBFTP shall include the ability to interface with a commercially available Global Positioning System (GPS) through an available port, and tag transactions with location information.

6.III-4.7 Installation Requirements - OBFTP

The Contractor shall work with designated staff from each Agency to determine on-board equipment location and installation restrictions, requirements and configurations. The joint consultation will include a prototype installation on each vehicle type in each Agency's fleet as described below. Any RFCS equipment mounted in a vehicle is subject to review and approval of the relevant Agency. Any modifications to existing stanchions or equipment (e.g. fareboxes) must be approved by the affected Agency.

- (a) All mounting hardware associated with the OBFTPs shall be provided by the Contractor.
- (b) Available mounting options shall include as a minimum: mounting on vertical stanchions, mounting above, in front of, or below horizontal stanchions, and mounting on horizontal or vertical dash or other flat surfaces.
- (c) The mounting hardware and the OBFTP shall be positioned such that it minimizes encroachment on the passenger and the driver, and does not obstruct the driver's right mirror field of vision and view to the right front of the bus including the view of the front door.
- (d) The OBFTP mounting location shall allow ease of driver entry and exit from the driver's compartment with no risk of injury such as knees.

- (e) The Contractor shall provide a flexible mounting system that allows the mounting location to be optimized, maximizing passenger throughput and driver operability and comfort.
- (f) The Contractor shall provide measurements and schematic drawings of any required stanchion modifications for each vehicle type and stanchion configuration.
- (g) Equipment installation shall be prototyped for each coach type at each Agency. The Contractor is advised that although similar coach types are in use at different Agencies, the interior configuration may be different. At a minimum, the prototyping process shall be as follows:
 - i. At Conceptual Design Review, the Contractor shall supply each Agency with a set of typical brackets, mounting hardware, and wiring such that Agency staff can test alternative equipment configurations.
 - ii. At Preliminary Design Review, the Contractor shall conduct a site survey of all coach types at each Agency, and working with Agency staff identify preferred installation, mounting and wiring of onboard equipment for each coach type.
 - iii. At Final Design Review, the Contractor shall finalize all mounting hardware, subject to approval by the Agency impacted. At the discretion of each Agency, final design shall be based on a) an Agency provided prototype or mock-up of the hardware, b) the Agency providing design details or drawings describing preferred installation, or c) the Contractor generating design details and recommendations. In any event, the Contractor shall be responsible for the preparation of all final design and fabrication documentation, molds, prototypes, and other materials required for equipment installation.
 - iv. Upon fabrication of the first article of installation hardware, the Contractor shall conduct a site survey of all coach types at each Agency to verify the correct design and fabrication of the hardware, and confirm suitability.
- (h) The Contractor shall provide fixed mounting hardware. The Contractor shall provide adjustable hardware as a Contract Option to be negotiated and exercised at the discretion of an Agency.
- (i) Stanchion modifications will be the responsibility of each Agency.

6.III-4.8 Rear Door FTP Units (Option)

The Contractor shall propose an option for the provision of rear-door fare transaction processors for Agencies who are considering all-door loading. Rear door FTP units shall meet the following additional requirements:

- (a) Rear door FTPs shall meet the installation requirements described in Section 6.III-4.7.
- (b) Rear door FTPs shall be slaved to the DDU or master FTP at the front door.
- (c) The operator shall not be required to enter additional log-on, parameter change or other data to initialize rear door readers or change status.
- (d) The operator shall have the capability of de-activating (turning off) the rear door readers from the DDU, independent of the front door reader.
- (e) A consolidated fare transaction data set for all readers on the vehicle shall be provided that includes the device ID of each reader.

6.III-5 Vehicle Logic Unit (VLU) - *[Provided by others]*

The information about the VLU in this Section is provided for information purposes only.

6.III-5.1 Subsystem Description – VLU

The VLU will be installed by others for the purpose of evolving to a fully integrated on-board system. This is referred to as the Full Integration Mode (FIM). When installed, the VLU will function as the on-board server or central processor. The VLU act as the communications interface between the OBFTP and WDOLS, tunneling data between the two devices. The VLU will also support multiple, concurrent applications such as vehicle location, passenger counting, vehicle operating data, stop annunciation and other functions, and will store and buffer data from these systems for off-load by the WDOLS.

As part of the transition from Limited Integration Mode (LIM) to FIM,

- the WDOLS connection will be moved from the OBFTP to the VLU, and data exchange with the data acquisition computer (DAC) will occur through the VLU; and
- the connection to the DDU will be moved to the VLU, and the operator interface with the OBFTP will occur through the VLU.

It is envisioned that the VLU and OBFTP will maintain exactly the same fare transaction data file, which will be verified upon data exchange, until cleared with instructions from the DAC. The DAC will segregate the data and forward all Smart Card transaction data to the clearinghouse.

6.III-6 Driver Display Unit (DDU)

6.III-6.1 Subsystem Description - DDU

The Driver Display Unit (DDU) shall display OBFTP information and provide the human interface for interacting with on-board systems. The DDU (DR 103) shall consist of a software programmable display with programmable soft keys on the perimeter.

The DDU shall be designed to provide real-time operation and control of a minimum of six (6) additional on-board systems or applications. Provided as information in Appendix F is an example "Conceptual King County Driver Display Unit Operating Concept". This document provides a conceptual example for King County of how the DDU might operate in a multi-application on-board environment.

In keeping with an open, modular system architecture, the Contractor shall provide a DDU that is packaged separately and not bundled with the FTP or WDOLS.

6.III-6.2 Functional Requirements – DDU

6.2.1 Keyboard

The keyboard (DR 103.01) shall provide the human interface with the OBFTP and other onboard subsystems.

- (a) The DDU keypad shall provide manual log-on (sign on) and log-off capabilities per the requirements of Section 6.III-3.2.0, and shall include functionality as required to support transfer of log-on information via the WDOLS.
- (b) The DDU shall transfer log-on data/changes to all connected devices through a single keypad entry or data transfer from a driver smart card. The DDU shall not require multiple re-entry of log-on data/changes to initialize multiple on-board devices.
- (c) The DDU shall be provided with a minimum of sixteen (16) programmable soft keys around the perimeter of the display (display keypad). The Contractor may propose a reduced key keypad provided that all functionality can be met, subject to approval by the Contract Administrator at Final Design Review.
- (d) The driver shall be able to enter fare set/category, fall-back voice radio channel, operator identification, run, route or time segmentation data and any other agency specific data on the driver keypad, either as a primary data entry or as a backup to any vehicle location system which may be installed to support this function.

- (e) The display keypad shall be capable of assigning keys such that multiple onboard functions can be controlled on each display “page”. E.g. some keys on a display page may be assigned to RFCS, while others may be assigned to the radio, PA, or other onboard functions.
- (f) The display keypad shall allow a return to the main screen or menu from any sub-level screen or menu with one key press.
- (g) The system shall be able to collect transaction data in the event incorrect log-on data is entered by the driver, or when no log-on is entered at all, the driver shall be alerted through an audible alarm, and a flashing message on the driver display.
- (h) The display keypad shall be software programmable, and shall allow a driver to conduct, as a minimum, the following smart card-related functions:
 - i. Override default fare payment parameters upon notification by the customer (e.g. override default settings to pay multiple fares from one card, pay for a “day pass”, pay for a special or promotional fare, pay for a passenger of with a different fare basis, pay for a customer traveling a greater number of zones than their Zone Fare Preference Preset, etc.)
 - ii. Conduct a fare transaction reversal (enabled only subject to Agency policy).
 - iii. Charge an upgrade fare for a customer traveling a greater number of zones than their Zone Fare Preference Preset after the initial transaction has occurred.
 - iv. Operate the farebox and other on-board systems in the LIM and FIM modes.
- (i) The display keypad shall be software configurable to /replace manual counters used with non-registering fare boxes, providing the ability to record non-smart card boardings through keypad data entry.
- (k) The display keypad and control logic shall be designed to minimize operator keystrokes. High priority functions (as defined by the Agencies during Conceptual Design Review) shall be located at the top level (first page) of the display. Medium and low priority/use functions shall be accessible within 2 additional keystrokes.

6.2.2 Display

The display (DR 103.02) shall allow monitoring of the OBFTP and any connected subsystems.

- (a) The message display area of the LCD shall allow monitoring of the OBFTP status and mirror the customer display during each transaction.
- (b) The message display area of the LCD shall not be overwritten with softkey labels except insofar as approved during Conceptual Design Review (CDRL 1).
- (c) The display shall serve as the monitor for interfacing with the FTP and any other connected subsystems for system maintenance and configuration changes.
- (d) The display shall be capable of displaying status information for multiple onboard functions simultaneously. E.g. the display may simultaneously display fareset, radio information, route-run information, etc.
- (e) The display shall display current time in hh:mm:ss format in characters sufficiently large to be read by the driver when seated.
- (f) The Agencies will define the message sets and formats with the Contractor during the design review process (DR 103.03).

6.III-6.3 Performance Requirements - DDU

The DDU technology shall be subject to Contract Administrator approval and shall meet the following requirements:

- (a) Readable in all lighting conditions encountered on a bus during day and night, such as direct sunlight or driving in rural areas with limited outdoor lighting.
- (b) The DDU shall have a minimum reliability of 30,000 MOHBF.
- (c) All keys or buttons shall have a minimum 10 year service life in normal operation, regardless of number of actuations. In the event that a key or button fails before the 10 year service life, it shall be replaced at no cost to the Agencies per Section 4.1 of Exhibit 14 of the Contract provided such failure does not constitute an Agency responsibility as defined in Section 4.2 of Exhibit 14.
- (d) The DDU shall continue to function and operate other onboard devices in the event of OBFTP failure.
- (e) The DDU shall be self-restarting, and shall not become unresponsive or require manual reboots or restarts to continue operation.

- (f) Upon removal of power from the ignition sense input of the device, the FTP and DDU shall execute automatic logoff and automatic power down functions with timeouts determined through configuration data.
- (g) The DDU shall include an automatic timed logoff function, initiated by removal of vehicle power at the ignition sense input of the DDU. In the event the operator does not logoff, removal of power from the ignition sense will automatically initiate the DDU logoff process after an Agency-configurable time period has expired. Such periods shall be configurable on an Agency by Agency basis.
- (h) The automatic logoff function shall be cancelled and reset if the power to the ignition sense is restored prior to expiration of the automatic logoff timer.
- (i) The automatic logoff function shall be cancelled and reset if the vehicle master switch is turned to any “run” position prior to expiration of the automatic logoff timer.

6.III-6.4 Physical Requirements – DDU

The DDU shall meet the physical requirements in Section 6.III-4.4 and the following:

- (a) The DDU shall be designed to be water and liquid resistant, and the enclosure shall be water and liquid tight.
- (b) Any leakage into the unit shall not cause the unit to become non-operational.
- (c) The DDU shall resist breakage due to accidental impacts from hard objects, such as briefcases during boarding, or wheelchair handles or other devices used by the disabled community.
- (d) DDU shall incorporate a back-lighted LCD graphics display with controls to turn the backlighting off and on, and vary the intensity of the display.
- (e) The message display area of the LCD graphics display shall be a minimum of 240x128 pixels (landscape format).
- (f) All softkey assignments shall be displayed outside of the message display area of the LCD display.
- (g) The Agencies require the overall size of the DDU to be the minimum feasible within these specifications and human factors requirements, as space within the driver compartment of the vehicles is very limited. The Contractor shall include scale drawings and mock-ups of the proposed DDU showing all dimensions.

6.III-6.5 Electrical Requirements – DDU

The electrical requirements specified in Section 6.III-4.5 shall apply to the DDU.

6.III-6.6 Data Exchange Requirements – DDU

- (a) The DDU shall contain at a minimum the following interfaces (DR 25) as illustrated in the Figures contained in Section 6.III-4.1.1 and 4.1.2:
- i. One (1) J1708 communications interface.
 - ii. One (1) RS232 communications interfaces for Agency use for controlling other devices.
 - iii. One (1) RS232 communications interface for diagnostic purposes.
 - iv. One (1) Ethernet/high speed serial communications interface.
 - v. One (1) RS485 Communication interface for Agency use for controlling the other devices.

6.III-6.7 Installation Requirements - DDU

The DDU shall be installed in accordance with the requirements specified in Section 6.III-4.7 as they apply to a DDU.

6.III-6.8 Integration Requirements – DDU**6.8.1 General Integration Requirements**

- (a) The DDU shall be fully integrated with other RFCS subsystems.
- (b) The Contractor shall cooperate and coordinate with Agency staff and other vendors to install and integrate additional applications on the DDU, and provide integration as described herein.
- (c) The DDU shall be designed to migrate from LIM to FIM integration without hardware changes or software upgrade.
- (d) The driver display unit shall have the capabilities to replace the existing King County Mobile Data Terminal (MDT) as the universal display/keypad device, and shall be adaptable by any agency to accommodate integration with their future on-board systems.
- (e) The Contractor shall develop the necessary software to support the on-board operations of the RFCS. The Contractor's software shall be integrated with software developed by others that supports existing systems.
- (f) The DDU shall be supplied with all required software tools, documentation, simulation and test routines, and other information as required to allow modification or the creation/installation of new applications by the Agencies.
- (g) As part of Design Documentation, the Contractor shall provide a fully detailed interface control document for all interfaces to third party devices (DR 103.04).

- (h) The return state of each on-board system (default state or last active state) shall be defined by the Agencies.
- (i) The priority of on-board systems and functions (assignments and messages on the primary and other screens) shall be subject to Agency review and approval during Conceptual, Preliminary and Final design. These priorities must be modifiable by the Agencies as required.
- (j) The DDU shall be capable of operating multiple on-board systems concurrently. These systems must be able to operate in an integrated manner (e.g. operate other on-board devices and display their status without interrupting fare collection processing and display).
- (k) The DDU shall not require interconnection with the FTP or other onboard devices to function.
- (l) Each Agency shall be able to configure key assignments, screen assignments, and menu structures independent of that of other Agencies.

6.8.2 Electronic Registering Farebox Integration (Option)

- (a) The Contractor shall develop an interface from the DDU to GFI registering fareboxes via the MIU. The interface between the DDU and the MIU shall be as agreed between the contractor and McCain Traffic Supply. The interface shall be documented (McCain Interface Specification) by McCain Traffic Supply and supplied to the Contractor.
- (b) The contractor shall develop the hardware, software, and firmware required to provide log-on, log-off, en-route trip change and other messages from the DDU through a RS485 port interface to the MIU.
- (c) Messages shall be sent between the DDU and MIU as detailed within the McCain Interface Specification in order to support the functionality described within the subsequent sections of 6.8.2 and 6.8.4.
- (d) The DDU shall include the capability of providing multiple transmissions/re-tries of a log-on/log-off/trip change message without acknowledgment. The number of retries shall be a user configurable parameter
- (e) The DDU shall include the capability of registering an acknowledgment of a message received from the MIU.

6.8.3 King County Radio Control Unit (RCU) Development and Integration (Option)

6.8.3.1 RCU Conceptual Design

- (a) The following tasks shall be completed by the Contractor as part of the RCU Conceptual Design:

- Task 1** Review existing RCU prototype documentation.
- Task 2** Conduct interviews and/or discussion groups with King County Staff.
- Task 3** Conduct interviews with the person who developed the original RCU prototype.
- Task 4** Develop and submit a Conceptual Design for the RCU, including the deliverables provided in (c) below, to be reviewed in accordance with Section 3.I-27.5 of the Contract.

(b) The objective of the RCU Conceptual Design Review (“CDR”) is to familiarize King County with the Contractor’s intended design activities, resolve external interfaces, and provide the basis for proceeding to Preliminary Design. Additionally, it will provide a foundation for the Parties to commence negotiations regarding a future change order for full design and production of the RCU. The CDR shall be performed in accordance with the provisions of the Contract.

(c) The Contractor shall submit the following deliverables as part of the Conceptual Design Review:

| | |
|---------------------------------|--|
| <i>Schedule Review</i> | Schedule compliance review and discussion of variances or delays. |
| <i>Functional Block Diagram</i> | Provide a functional block diagram of the system and equipment. |
| <i>Data Model</i> | Provide a top-level data model illustrating the major functional entities and relationships |
| <i>Design Review Item</i> | Provide an outline of Design Review (DR) item 103.6 from Figure II-11.3 in the Contract. |
| <i>Narrative</i> | Provide a narrative description of the RCU as proposed by ERG, including components supplies by subcontractors. |
| <i>Interfaces</i> | Identify all interfaces between the RCU and other on-board devices, provide a schedule, and identify responsibilities for completion of detailed definition of the interfaces. |
| <i>King County Environment</i> | Confirm that ERG is familiar with the operations and maintenance environment for the RCU. |
| <i>Physical Dimensions</i> | Provide physical dimensions of the proposed RCU. |
| <i>Power Requirements</i> | Identify power and facility requirements for the RCU. |
| <i>Decisions</i> | Identify information needs and decisions required from King County. |
| <i>Problems</i> | Provide description of problem tracking, resolution and reporting process. |
| <i>Proposed Price</i> | Provide a proposed unit price for the RCU. |

- 6.8.3.2 Design Completion and Development of RCU (if authorized by subsequent Change Order)
- (a) The Contractor shall develop a Radio Control Unit for King County (DR 103.06) to interface with on-board devices as illustrated in Section 6.III-4.1. The primary purpose of this device is to operate King County's legacy radio/AVL system. Additional information is contained in Appendix E, and prototype documentation (from a previous project) will be made available from King County at or prior to Conceptual Design.
 - (b) The RCU shall enable existing King County Mobile Data Units (MDU) to interface to the legacy 450 MHz GE Delta-S radio and current model Motorola or Ericsson 450 MHz radios.
 - (c) The Contractor shall develop a production version of the RCU based on a current King County prototype. Work activities shall include:
 - i. DDU-RCU design and software interfaces.
 - ii. Obtain test bench equipment (to be provided by KCM):
 - GE Delta-S radio
 - MDU (Mobile Data Unit)
 - Radio handset
 - PA microphone
 - Emergency alarm switch
 - Inside and outside public address speakers
 - iii. Confirm whether to use J1708 or other protocol for communications.
 - iv. Complete programming and software development to support required RCU functionality.
 - v. Test prototype on a bench
 - vi. Field test prototype. Test procedures shall be approved by the Contract Administrator.
 - vii. Manufacture production units.
 - viii. Conduct functional, performance, EMI, RFI and environmental testing.
 - (d) The Contractor shall integrate the RCU with the DDU.
 - (e) The DDU shall be designed to migrate from LIM to FIM integration without hardware changes or software upgrade.
 - (f) Implementation shall be per the requirements of Section 6.II-11.1.2.3.
 - (g) When the ARI/MDU is in Init Mode, the driver must log-on to the radio system through the DDU in order to receive or originate calls. Whenever

the ARI/MDU is in Init Mode, the DDU shall immediately display the following message on the screen, and shall sound an audible warning. The message shall consist of the following:

RADIO LOGGED OFF

PRESS OK TO CONTINUE

OK

When the driver presses the “OK” key, the DDU will proceed to the logoff sequence. The “Radio Logged Off” message shall be displayed until the “OK” key is pressed, or until the DDU executes an automatic logoff. Triggering of an automatic DDU logoff shall not be affected by ARI/MDU status.

6.8.4 Community Transit Integration

- (a) The DDU shall include application software to communicate with the McCain Traffic Supply interface board (MIU). The MIU will control the following devices on Community Transit vehicles (DR 103.07):
 - i. Transit signal priority (TSP).
 - ii. Destination sign.
 - iii. GFI Farebox (per section 6.8.2).
- (b) Log-on data shall be transmitted to the MIU.
- (c) Starting trip information shall be validated in the DDU and transmitted to the MIU.
- (d) Run list shall be compiled and displayed on the DDU.
- (e) The driver shall be able to select the next trip number, and the DDU shall transfer updated trip data to the MIU.
- (f) Community Transit requires that the following data be stored, on-board in the RFC System:
 - (i) Current (Prior to the transmission to the destination sign, at which time it should be deleted) and pending destination sign configuration files (for the future transmission to the destination sign, at which time it should be deleted);
 - (ii) Current and pending trip information;
 - (iii) Run list.

- (g) The Agencies shall provide two (2) MIUs and the software interface specifications to the Contractor at its office in Seattle, Washington in sufficient time to permit the Contractor to accomplish the work in accordance with the Baseline Project Schedule (CDRL 42). The MIUs so provided shall be 80% to 90% fully developed, capable of controlling the GFI farebox, the TSP and the destination sign and capable integrating with the DDU. The MIU shall further contain a test mode capable of returning appropriate information to the DDU on receipt of messages from the DDU.

EXHIBIT 6.III-6.1
PRELIMINARY CT TRIP DATA FILE FORMAT

| Field Number | Field Length | Abbrev. Length | Contents |
|--------------|--------------|-------------------|---|
| 1 | 2 | 1 | Owner / Operator |
| 2 | 10 | 6 | Effective date |
| 3 | 1 | 1 | Days of operation |
| 4 | 8 | 1 | Schedule (Weekday, Saturday, Sunday) |
| 5 | 3 | 3 | Route |
| 6 | 4 | 4 | Run |
| 7 | 5 | 5 | Trip |
| 8 | 5 | 4 | Start of trip (hh:mm) |
| 9 | 5 | 1 | Direction of travel |
| 10 | 1 | 1 | Fareset |
| 11 | 20 | 20 | Unused (to include TSP or other data as needed) |

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6.8.5 King County Full Integration Mode (FIM)**6.8.5.1 General**

The Contractor shall provide applications, software, test elements, and testing for the integration of the Driver Display Unit (DDU) with the On-Board Systems (OBS) being developed by another vendor (OBS/CCS vendor). Such integration shall be implemented on King County coaches and Sound Transit coaches operated by King County (hereinafter collectively referred to as KCM coaches).

The DDU shall be modified to provide for two modes of operation:

1. Limited Integration Mode (LIM) representing the current (pre-OBS) condition and operations, as well as the current condition and operations of all other Agencies.
2. Full Integration Mode (FIM) representing King County on-board system operation when the OBS equipment is installed and operational.

Modifications to the DDU shall not adversely affect operation on the device on other (non-King County or Sound Transit coaches operated by others) coaches or services, or introduce additional steps or workload for the operators of those services.

As required in Section 6.III-6.8.1 and 6.8.3, the DDU will be integrated with the RCU and King County's existing on-board systems in limited integration mode (LIM) until all KCM coaches have new OBS and Transit Radio Systems installed. For FIM, the Contractor shall provide design, development and testing documentation, software tools and test apparatus, as agreed upon by the Parties, for the OBC/CCS vendor to develop a new on-board non-RFCS application ("OBS Application") that will reside on the KCM DDU platform and integrate with the VLU (Vehicle Logic Unit) being supplied by the OBS/CCS vendor.

The Contractor shall be responsible for development, modification, integration and testing of all RFCS software on the DDU, RCU and On-Board Fare Transaction Processor (OBFTP) as required to provide the functionality described herein, and maintain RFCS fare collection functionality and operations. All applicable devices in the KCM coaches shall be updated with new software containing the OBS Application and updated AFC and RCU applications as required to support both LIM and FIM functionality prior to the first phase of installation of OBS equipment.

For purposes of this Section, the following terms shall have the following meanings:

- a. Automatic Fare Collection (AFC) Application: Contractor-developed RFCS software that is necessary to meet the requirements of this Section, including on-board software related to the DDU and OBFTP, as well as any test and back office software that is created or revised to meet the requirements of this Section.
- b. DDU Monitor Application: Contractor-developed application to be provided to the OBS/CCS vendor for display of additional DDU Common Store variables and variable sets via diagnostic interface.

- c. OBS Application: the non-RFCS application to be developed by the OBS/CCS vendor and loaded onto the DDU, which will integrate with the Vehicle Logic Unit (VLU). The VLU, in turn, manages the OBS devices and interfaces, such as the new 700 MHz radio system.
- d. OBS Stub Application: Contractor-developed application to be deployed to all RFCS coaches to communicate configuration status to the AFC application. LIM mode will be the default configuration until the OBS Application detects the presence of OBS equipment.
- e. RCU Application: Contractor-developed software required to operate the King County Radio Control Unit (RCU) and provide functionality described in 6.8.5.4 of this Change Order.

6.8.5.2 DDU Monitor Application

The Contractor shall provide a DDU Monitor Application, which will be a development tool for displaying additional DDU Common Store variables and variable sets via a diagnostic interface.

6.8.5.3 OBS Stub Application/Test Harness

- a. The Contractor shall develop an OBS Stub Application, the role of which is to communicate to the AFC Application, via the **FIMConfig** mechanism, described below, that LIM mode is enabled in the absence of OBS equipment. The Stub Application will be deployed to all RFCS Agency coaches as part of the revisions to the AFC Application prior to implementation of the OBS Application in order to confirm that changes to the AFC Application have not affected RFCS functionality. On coaches operated by King County, the OBS Stub Application will be replaced by the OBS Application once it is available and has been certified by the Contractor per the provision of Section 4.0 of this Change Order.
- b. The Contractor shall provide a testing capability for OBS operations that affect the DDU. A set of test commands will be created via the DDU Monitor Application. These test commands will be limited to providing a mechanism to manually modify and validate the contents of the new variable sets added to the DDU Common Store in order to implement this Change Order.
- c. The OBS Stub Application may also be used as a development tool to provide simulation of various on-board operations to aid in the development of software for AFC Application integration.

6.8.5.4 RCU Application

- a. Rather than duplicate a large number of existing DDU template resources, the OBS Application and RCU Application will share the appropriate existing template resources. The decision on which of these applications accesses the shared template resources is to be made by the OBS Application based on whether or not FIM mode is enabled.

- b. The Contractor shall modify the RCU Application to only access the existing template resource once LIM mode had been detected. In the case of FIM mode being detected, the RCU Application shall be modified to behave in a passive manner to allow the OBS Application to gain access to the existing template resources and perform the desired FIM mode operations.
- c. The operation of the existing RCU Application shall be maintained for LIM until every KCM coach has been equipped for FIM.

6.8.5.5 OBS Application and AFC Application Changes for FIM Configuration

- a. The OBS Application shall be separate and distinct from the existing RCU Application that interfaces with the legacy KCM radio system. The operation of the existing RCU Application shall be maintained for LIM until every KCM vehicle has been equipped for FIM.
- b. The OBS Application shall be downloaded by the Contractor to the DDU prior to installation of OBS hardware per an agreed upon schedule. The OBS Application will detect the presence (FIM mode) or absence (LIM mode) of OBS hardware. The OBS Application will provide integration status to the DDU and AFC applications which shall self-configure accordingly without the need for driver input or action.
- c. The OBS Application will notify the AFC Applications of the integration state (either LIM or FIM) so that operations with legacy radio equipment via the RCU Application can be maintained until the deployment of OBS hardware on each vehicle. The Contractor shall provide a mechanism via the DDU Common Store that allows the OBS Application to communicate this information to the AFC application. This mechanism shall be referred to as **FIMConfig**.

Login Process

- d. From the user viewpoint the login screens and process will appear the same in LIM and FIM. For FIM, the login process will be shared between the AFC and OBS Applications. The AFC Application will continue to manage Operator login and validation. The AFC Application will provide the Operator login data and status to the OBS via the DDU Common Store.
- e. The OBS Application shall take over the responsibility of managing rout/run entry and trip selection and will also be responsible for the communication of the resulting trip login information to the AFC Application. To support this recruitment, the Contractor shall provide a mechanism via the AFC Application, using the DDU Commons Store that allows the OBS Application to communicate login information to the AFC application is required. This mechanism will be referred to as **FIMTripInfo**.
- f. An agency-defined, unique Trip ID will be provided by KCM to the OBS and RFCS devices. Across a year's three major service changes and the bi-weekly Configuration Data (CD) distributions, these Trip IDs will not be re-used. Also, for the life of major service change, a Trip ID will always refer to the same trip. These two conditions are

required to avoid undetected mismatches in datasets between the two systems. The Contractor shall modify CD formats to allow such agency Trip ID to be delivered to the DDU/OBFTP.

Automatic Next Trip Selection

- g. To support the OBS-Initiated route/run/trip selection requirement, the Contractor shall provide functionality to enable the implementation of the following sequence of events while in FIM mode:
1. At a point in time just prior to reaching the end of trip location, the OBS Application shall direct the DDU to display a message in its VLS window asking the driver to confirm the change to the next trip, and also display the “Start Next Trip” icon for the driver to press the associated key to trigger this confirmation.
 2. After the Operator presses the “Next Trip” button, the OBS Application shall notify the AFC Application of the change to the next trip via the **FIMTripInfo** mechanism.
 3. The AFC Application shall validate the trip information provided by the OBS Application. If an error occurs, an error message shall be returned to the OBS Application via the **FIMResult** mechanism. If successful, the AFC Application shall complete the change to the next trip, communicate the appropriate information as positive feedback to the OBS application and set the AFC device mode to “On-Trip.”
 4. New trip and fare information shall be displayed on the DDU.

Automatic Fare Change at Zone Boundaries

- h. To support the OBS-initiated fare change requirement, the Contractor shall provide functionality to enable the implementation of the following sequence of events while in FIM mode:
1. The AFC CD will set the default fare table and initial Distance Code at the start of each trip. The fare table defines the range of fare alternatives that are possible for the selected trip.
 2. The Contractor shall provide functionality for the OBS Application to communicate a desired fare change to the OBFTP based on the vehicle’s location. This mechanism will be referred to as **FIMFareset**.
 3. The Contractor shall provide functionality for the AFC Application to communicate to the OBS Application whether or not the driver has manually changed the current default fare since the start of the current trip. This mechanism will be referred to as **FIMStatus**.

4. The Contractor shall provide for the AFC Application to communicate to the OBS Application whether any OBS-communicated fare set change was successful or unsuccessful and return the result as **FIMResult**.
5. If the AFC Application is on-trip and it receives a request by the OBS Application to change the current default Distance Code via the **FIMFareset** mechanism, and the driver has NOT manually changed the current distance code since the start of the current trip, then the AFC Application shall:
 - Automatically change the current default fare in use by the AFC Application, and
 - Notify the OBS Application that the request was successful via the **FIMResult** mechanism.
6. If the AFC Application is on-trip and it receives a request by the OBS Application to change the current default fare via the **FIMFareset** mechanism, and the driver has manually changed the current fare since the start of the current trip, then the AFC Application shall:
 - Notify the OBS Application that the request was unsuccessful via the **FIMResult** mechanism.
7. When the driver manually changes the default fare on the AFC Application via the Change Fare function, the AFC Application shall notify the OBS Application of this via the **FIMStatus** mechanism.
8. The initial Trip Distance Code, fare table(s) and peak/off peak designator, will come from RFCS CD as exported by KCM. The default fare can be overridden by the driver and the driver will retain the ability to manually select from the available fare tables for the trip.
9. OBS initiated fareset changes will be limited to the valid distance codes in the AFC designated default fare table.
10. The OBS Application shall not include functionality to automatically set or change the fare table as part of the fareset change.
11. When the Operator begins a new trip the AFC Application will reset the default fare table and Distance code for that trip.

6.8.5.6 CCS Initiated Changes

- a. While operator login/logoff will still generally be performed by the existing DDU applications, the OBS Application also will be able to automatically initiate an operator login/logoff or update certain login-related parameters such as route/run/trip selection. Such commands will be issued by the OBS based on instructions sent from the Communications Center System (CCS) by a Communications Coordinator (dispatcher).

Such operation shall be referred to as a “CCS-Initiated” login/logoff or login parameter change (route/run/trip). To support this requirement, the Contractor shall provide functionality in the AFC Application (using the DDU Common Store) to allow the OBS Application to communicate operator login, operator logoff to the AFC Applications via the **FIMLogon** mechanism, and/or route/run/trip selection to the AFC Applications via the **FIMTripInfo** mechanism. When a Coordinator using the Communications Center System (CCS) provides the OBS Application with an operator ID to log in, a password is not required.

- b. The Contractor shall provide functionality in the AFC Application (using the DDU Common Store) to communicate the result of CCS-Initiated Operator login/logoff and/or route/run/trip selection back to the OBS Application via the **FIMResult** mechanism.
- c. To support the CCS-Initiated operator login requirement, the Contractor shall provide functionality to enable the implementation of the following sequence of events while in FIM mode:
 1. The OBS Application shall communicate the required information via the **FIMLogon** mechanism as specified above.
 2. The AFC Application shall validate the information provided by the OBS Application as required for fare collection operation.
 3. If a validation error occurs, an error message shall be returned to the OBS Application via the **FIMResult** mechanism. If successful, the AFC application shall complete the login process, communicate the appropriate information as positive feedback to the OBS Application and set the DDU/OBFTP device Mode to “Off-Trip.”
 4. The OBS Application shall determine whether or not to display Route/Run Entry and Trip Selection screens before triggering a route/run/trip change.
- d. To support the CCS-Initiated operated logoff requirement, the Contractor shall provide functionality to enable the implementation of the following sequence of events while in FIM mode:
 1. The OBS Application shall communicate the required information via the **FIMLogon** mechanism.
 2. If an error occurs with logoff, an error message shall be returned to the OBS Application via the **FIMResult** mechanism. If successful, the AFC Application shall complete the logoff, communicate the appropriate information as positive feedback to the OBS Application, and set the DDU/OBFTP device mode to “Login.”
 3. The AFC Application shall display the normal login screen sequence.

6.8.5.7 Display of Debugging/Maintenance Variables

The Contractor shall provide a mechanism via the DDU Common Store for the OBS Application to display a set of 10 variables for debugging/maintenance purposes. The values of these variables shall be provided via the DDU's diagnostic port. The OBS/CCS vendor will be responsible for providing a list of such variables and their descriptions.

6.8.6 Discussion with King County and its OBS Contractor

- a. The Contractor shall participate in pre-design discussion with representative of the County and the OBS/CCS contractor regarding the following:
 1. Possible alternative approaches integrating the DDU with OBS/CCS and TRS;
 2. Any modifications to, and applications on, the DDU that may be required to implement the integration approach(s);
 3. The information sharing and coordination activities that may be required between the Contractor and the OBS/CCS contractor in order to perform necessary design, development and testing;
 4. The technical issues that will need to be resolved as the design process proceeds, and the mechanism for resolution; and
 5. The process that Contract uses to certify any new applications developed.

In addition to such pre-design discussions, the Contractor staff shall promptly undertake such research, drafting and other work as necessary to support these pre-design discussions, subject to the limits provided below in Section 2.0. The Contractor, the County and the OBS/CCS contractor shall attempt to develop by June 30, 2007, an agreed approach to the integration and a schedule of tasks required to complete the design efforts during the OBS/CCS contractor's design phase.

- b. The Contractor agrees to make the necessary technical staff available for said discussions, including at a minimum the Contractor

1. Configuration Data (CD) as it relates to the import, management and formatting of KCM-generated block, route, trip and other operational data, handling of CD as the various tiers of the RFC system and management of CD consistent sets.

2. Transmission to, and management of, configuration data on the Driver Display Unit (DDU), including knowledge of file formats, compression algorithms, security provisions, etc. as they apply to CD payloads transmitted from the Data Acquisition Computer (DAC) to the DDU/OBFTP.
 3. Low-level DDU software and software driver functionality, including particular drivers and interfaces to third party applications and external devices as contemplated in Full Integration Mode (FIM).
 4. DDU screen, key and template configuration and management.
 5. Application management on the DDU.
 6. Read/write access to shared memory areas of the DDU, and procedures for accessing shared data.
 7. Third party application testing and certification processes as they apply to the DDU.
- c. The Parties anticipate such discussion shall occur between April 1 and June 30, 2007. The County shall work with the Contractor to schedule the relevant Contractor staff for telephone or in-person meetings at County request. The Contractor will exercise its best efforts to make the relevant staff available when requested by the County, provided the Contractor is given at least two weeks of advance notice for any in-person meetings.
- d. The results of the pre-design discussions will be recorded in a tabular form by County representatives and provided to the Contractor, with such record representing the understanding of the Parties with respect to the issues identified in 1.1. Within fourteen (14) calendar days of receipt of this record, the Contractor shall either confirm or modify the record to reflect Contractors understanding.
- e. The meeting and information sharing described above are contingent upon the county's contractor(s) entering into a Non-Disclosure Agreement with ERG.

6.8.6 Discussion with King County and its OBS Contractor

- a. The Contractor shall participate in pre-design discussion with representatives of the County and the OBS/CCS contractor regarding the following:
 - i. Possible alternative approaches integrating the DDU with OBS/CCS and TRS;
 - 2 Any modifications to, and applications on, the DDU that may be required to implement the integration approach(s);

- 3 The information sharing and coordination activities that may be required between the Contractor and the OBS/CCS contractor in order to perform necessary design, development and testing;
- 4 The technical issues that will need to be resolved as the design process proceeds, and the mechanism for resolution, and
- 5 The process that Contractor uses to certify any new applications developed.

In addition to such pre-design discussions, the Contractor staff shall promptly undertake such research, drafting and other work as necessary to support these pre-design discussions, subject to the limits provided below in Section 2.0. The Contractor, the County and the OBS/CCS contractor shall attempt to develop by June 30, 2007, an agreed approach to the integration and a schedule of tasks required to complete the design efforts during the OBS/CCS contractor's design phase.

b. The Contractor agrees to make the necessary technical staff available for said discussion, including at a minimum the Contractor staff that are qualified in the following areas of the RFCS project:

1. Configuration Data (CD) as it related to the import, management and formatting of KCM-generated block, route, trip and other operational data, handling of CD at the various tiers of the RFC system, and management of CD consistent sets.
 2. Transmission to, and management of, configuration data on the Driver Display Unit (DDU), including knowledge of file formats, compression algorithms, security provisions, etc. as they apply to CD payloads transmitted from the Data Acquisition Computer (DAC) to the DDU/OBFTP.
 3. Low-level DDU software and software driver functionality, including in particular drivers and interfaces to third party applications and external devices as contemplated in Full Integration Mode (FIM).
 4. DDU screen, key and template configuration and management.
 5. Application management on the DDU.
 6. Read/write access to shared memory areas of the DDU, and procedures for accessing shared data.
 7. Third party application testing and certification processes as they apply to the DDU.
- c. The parties anticipate such discussion shall occur between April 1 and June 30, 2007. The County shall work with the Contractor to schedule the relevant Contractor staff for telephone or in-person meetings at County request. The Contractor will exercise its best efforts to make the relevant staff available when requested by the County,

provided the Contractor is given at least two weeks of advance notice for any in-person meetings.

- d. The results of the pre-design discussions will be recorded in a tabular form by County representatives and provided to the Contractor, with such record representing the understanding of the Parties with respect to the issues identified in 1.1. Within fourteen (14) calendar days of receipt of this record, the Contractor shall either confirm or modify the record to reflect Contractor's understanding.
- e. The meeting and information sharing described above are contingent upon the county's contractor(s) entering into a Non-Disclosure Agreement with ERG.

6.8.7 Application Certification

- (a) The Contractor shall provide a process and facilities for certifying new applications created on the DDU (DR 103.08) including:
 - i. Contractor Developed DDU applications.
 - ii. Agency Developed DDU applications.
- (b) Contractor Developed Applications:
 - i. The Contractor shall provide processes and facilities for the Contractor to certify that any new application does not impact other DDU applications or functionality.
 - ii. The Contractor shall certify that any new application does not impact other DDU applications or functionality.
- (c) Agency Developed Applications:
 - i. The Contractor shall provide processes and facilities to certify that a new application developed by or on the behalf of the Agencies, does not impact RFCS functionality.
 - ii. The Contractor shall provide processes and facilities to certify that a new application developed by or on behalf of the Agencies, does not impact other (non-RFCS) DDU functionality.
 - iii. The Contractor shall provide processes and tools for an Agency to test and certify that a new application does not impact other (non-RFCS) DDU applications.

- (d) Any additional applications shall be certified prior to release in the RFCS.

6.III-7 Wireless Data On/Off Loading System (WDOLS)

6.III-7.1 Subsystem Description

The Contractor shall provide a Wireless Data On/Off Loading System (WDOLS) (DR 104) as the primary method for permitting connectivity from any Ethernet-enabled on-bus device to DACS or other fixed-location equipment. Also, the WDOLS may be used to transfer data from FTPs in remote locations where installing a hard wire communications link is the less cost effective solution, e.g. stand-alone FTPs located on docks in the WSF environment or platforms in the Sound Transit environment, or portable FTPs equipped with a wireless client adapter. The proposed technology shall be subject to the review and approval of the Contract Administrator.

In order to support on-board integration in the bus environment, the WDOLS shall be a stand-alone unit connected initially to the Ethernet Switch, and reconfigurable such that it can be connected in the future to a VLU. High speed (≥ 1 Mbps) data throughput is required in order to support future data on/off load requirements that will extend beyond the RFCS data.

6.III-7.2 Functional Requirements

- (a) The WDOLS shall automatically provide wireless connectivity, subject to appropriate network access, when a bus or other FTP equipped with WDOLS communications capabilities (DR 104.01) enters the range of operation
- (b) WDOLS equipment at transit bases or other fixed locations (DR 104.02) shall be able to communicate with all WDOLS equipped buses, regardless of agency.
- (c) Vehicles shall not be required to stop during the data exchange.
 - i. The Contractor shall indicate the maximum vehicle speed to permit successful data exchange.
 - ii. The vehicle speed limit shall be subject to Contract Administrator approval prior to implementation.
- (d) At a minimum, the WDOLS shall be used for the following:
 - i. Uploading of transaction data captured at the FTP
 - ii. Downloading of files such as:
 - Software configuration files
 - FTP initialization
 - Fare tables
 - Blocked card list
 - Automatic revalue list, if used

– Other operational parameter tables

6.III-7.3 Performance Requirements - WDOLS

The data transmission speed shall be sufficient to on- and off-load on-board transaction data from the entire fleet or designated remotely located FTPs, at a minimum on a daily basis.

- (a) The WDOLS data transfer process shall be transparent to current operations and shall not require operational modifications.
- (b) The WDOLS shall have a minimum reliability of 30,000 MOHBF.
- (c) The WDOLS Access Point(s) shall provide coverage for a range of at least 1000 feet between the vehicles and external antenna units.
- (d) The data exchange rate shall be a minimum of 1 megabit per second either for a single channel device, or an aggregate of 1 megabit per second for a multi-channel, simultaneous communications device.
- (e) The data exchange shall not be affected by other Radio Frequency (RF) sources or transmissions.
- (f) The WDOLS shall conform to the IEEE 802.11b communications standard or Contract Administrator approved equivalent.
- (g) The WDOLS shall include features to support future upgrade to emerging IEEE 802.1X standards.
- (h) The on-board WDOLS shall be compatible with existing Cisco Aironet 350 equipment, and shall not interfere with other 802.11b data transfer systems.

6.III-7.4 Physical Requirements – WDOLS

- (a) In keeping with a modular, open architecture, the WDOLS shall be packaged separately, and not bundled with the FTP or DDU.
- (b) The enclosure materials shall be high strength polycarbonate, cast aluminum, stainless steel or equivalent subject to the review and approval of the Contract Administrator.
- (c) Enclosure shall be vandal resistant, flame retardant and resistant to common solvents and cleaning materials.
- (d) The WDOLS shall be sealed to prevent any degradation in operation due to the accumulation of dust, salt, mud, detergents, solvents, or moisture.
- (e) Any outdoor mounted equipment shall be rated for operation in an exposed environment.

6.III-7.5 Electrical Requirements – WDOLS**7.5.1 Vehicle Mounted Equipment**

The electrical requirements specified in Section 6.III-4.5 shall apply to all vehicle mounted WDOLS equipment.

7.5.2 Base or Terminal Mounted Equipment

The electrical requirements specified in Section 6.III-1.6 shall apply to all base or terminal mounted WDOLS equipment.

6.III-7.6 Data Exchange Requirements – WDOLS

- (a) The Contractor shall provide a high-speed serial communications device that meets the performance requirements in 6.III-7.3. In the initial, limited integration mode (LIM), the WDOLS shall be connected directly to the Ethernet Switch. In the future, full integration mode (FIM), the WDOLS shall be disconnected from the Ethernet Switch and connected to the VLU.
- (b) Communications between the WDOLS and Ethernet Switch/VLU shall be by high speed (1Mbps or greater) serial communications.
- (c) The WDOLS shall include data integrity features such as, but not limited to, a check to ensure that the data to be downloaded has been captured by the FTP and a check to ensure that no duplicate downloads or uploads of data occur.
- (d) In the event of a failed data exchange attempt, the system shall sound an alarm at the DDU and the DAC, and log the event in the FTP and the DAC.
- (e) Immediately following the failed data exchange event, the DAC shall notify the clearinghouse of the event.
- (f) The WDOLS shall also provide anti-collision such that multiple vehicles can be parked in the same area without loss or corruption of data.
- (g) The WDOLS shall be capable of handling data from multiple on-board sources, such as the APC system, AVL system, electronic farebox, and various engine/vehicle monitoring systems.
- (h) The Base WDOLS shall be capable of sorting multiple data types into appropriately labeled files that can be managed with standard data management software.
- (i) The contractor shall propose troubleshooting tools that allow agency staff to identify and fix data exchange problems occurring in the WDOLS.

- (j) The Contractor shall provide a method, subject to Contract Administrator approval, of managing the data exchange to ensure that the appropriate data is exchanged at the appropriate location and time (DR 104.03).
- (k) The WDOLS shall include security protections (DR 104.04) over and above Wired Equivalency Protections to guard against:
 - i. Unauthorized access to RFCS data transferred via the WDOLS.
 - ii. Unauthorized access to Agency networks through the wireless system.
- (l) The WDOLS communications approach and security provisions (DR 104.04) shall be subject to approval by each Agency's designated network security group or manager.
- (m) The WDOLS security provisions shall conform to Agency policies or specifications for IEEE 802.11 based wireless technology. Policies and/or specifications shall be provided to the Contractor at Conceptual Design Review.
- (n) The WDOLS shall be designed to migrate from LIM to FIM, where the VLU or other means will be provided for management of data transferred to or from the vehicle.

6.III-7.7 Installation Requirements - WDOLS

7.7.1 Vehicle Mounted Equipment

- (a) Any WDOLS related equipment on-board any vehicle shall meet the requirements in Section 6.III-4.7.
- (b) The antenna location(s) for each agency shall be subject to approval by the respective agencies.
- (c) Any exterior mounted equipment shall be sealed to prevent leakage of rain or bus washer fluids through the life of the installation.

7.7.2 Operating Base Mounted Equipment

- (a) The antenna shall be mounted in or near a location approved by the Contract Administrator.
- (b) The Contractor shall finalize the locations of any externally mounted antennas with the Contract Administrator during the design review process (DR 42).
- (c) The Contractor shall mount all WDOLS related equipment and shall make all power and communications connections.

6.III-8 PORTABLE FARE TRANSACTION PROCESSOR (PFTP)

6.III-8.1 Subsystem Description - Portable FTP

The Contractor shall provide portable FTPs for Agencies that have a need for a portable card reading and transaction processing device.

The Portable FTP (DR 105) shall be a handheld, ruggedized unit operated by Agency personnel to process RFCS transactions in a mobile or portable environment. The PFTP will be powered by a rechargeable battery that can be recharged by placing the unit in a 110VAC-powered cradle or in a 12VDC powered cradle or mount for in-vehicle use.

The PFTP shall be supplied in two configurations:

As a limited function, verifier only PFTP (DR 105.01) for Sound Transit proof of payment fare inspection. The unit shall be light, have low power consumption, and be able to conduct fare verification with minimal operation by the fare inspector.

A full-function PFTP (DR 105.02) for agencies such as WSF and Kitsap Transit, and potentially for paratransit and vanpool applications.

The Portable FTP (PFTP) shall, at a minimum, consist of the modules listed in Figure III-8.1.

**Figure III-8.1
PFTP CONFIGURATION SUMMARY**

| Modules | Portable FTP |
|---|-------------------------|
| Central Processing Unit | X |
| Contactless Card Interface | X |
| Customer Display/Indicator | X |
| Standard Battery | X |
| Belt Carry Case | O |
| Shoulder Carry Case | O |
| 110 VAC Charger/Cradle - 1 Unit | O |
| USB to Ethernet Cable for 1 Unit Charger/Cradle | O |
| 110 VAC Charger/Cradle - 4 Units w/ Ethernet | O |
| 12 VDC Charger/Cradle | O |
| Wireless Radio (RA2041) | O* |
| Dial-Up Modem & Cable (may be external) | O* |
| High Capacity Battery | O |
| Bar Code Scanner | O |
| Pistol Grip | O |
| RAM B101 Vehicle Mount for PFTP | O |

"X" denotes module required by Contract and included in the Contract price schedule.

“O” denotes optional module that shall be available as a priced option, also included in Contract price schedule.

* Certain Agencies require that the PFTP be equipped with a wireless radio (Psion RA0241) based on 802.11 technology, or with an external modem, depending on the requirements of each Agency. Quantities and configurations to be finalized at the time of order.

6.III-8.2 Functional Requirements - Portable FTP

The following functional requirements supplement those stated in Section 6.III-3.2.

- (a) Log-on from Agency personnel shall occur via a log-on smart card or through a built-in PFTP keypad.
- (b) For ferry applications (Washington State Ferries, Kitsap Transit, and potential future ferry services), the operator shall be able to select a destination and associated fare basis through the portable FTP keypad.
- (c) Except as noted in (e), the PFTP shall require no interaction other than the tag of a card within an Agency-configurable timeout period to perform card inspections. The timeout period shall automatically reset in the event of any of the following:
 - i. The card inspection mode of the PFTP has been selected.
 - ii. Inspection mode is re-activated by the inspector after a timeout.
 - iii. A previous inspection has been completed.
- (d) The verifier-only PFTP shall record inspection counts by fare category, fare type, operator ID, and time segment.
- (e) The verifier-only PFTP shall include functionality to inspect a card status including “tagged-in” or “tagged-out” status, and time of last transaction.
- (f) The verifier-only PFTP shall allow an Agency to determine whether or not an operator is required to enter/select route and run depending on what service the verifier is sued on or assigned to.
- (g) For Sound Transit, route and run selection will be required for SOUNDER commuter rail services, but not for LINK light rail services. An additional Agency sub-type classification shall be added to the Sound Transit configuration of the verifier-only PFTP to allow switching the PFTP between “SOUNDER” and “LINK LRT” using the device maintenance screen.

- (h) The PFTP shall allow the operator to override a default fare transaction (e.g. to pay for multiple fares from a single card, or to pay a fare other than the default).
- (i) The full function PFTP shall perform all functions of the verifier, plus, Agency personnel shall be able to:
 - i. Determine card balance, number of stored rides on the card, or the existence of a pass.
 - ii. Provide historical information to the Cardholder by scrolling through the transaction history of the last ten transactions stored on the card.
- (j) The PFTP application for WSF shall be designed to accept and process both RFCS smart cards and Washington State Ferries Electronic Fare System media.
- (k) PFTPs for KT applications shall include the following functionality:
 - i. An aggregate count of all (farecard and non-farecard combined) fare transactions that occur in a trip shall be recorded and displayed on the PFTP screen. Passenger counters shall reset with each new trip start.
 - ii. Buttons and/or touchscreen icons shall be identified for the purpose of recording non-farecard ridership counts. Buttons/touchscreen icons shall be allocated for KT fare categories, and ridership counts shall be generated/updated on pressing of the ridership button/icon.
 - iii. A next trip button shall be included for quick commencement of the next trip in the run schedule.
 - iv. Activation of data transmission to the DACS shall be periodically initiated by the operator at such time as the operator is near a WDOLS location. In the event that an operator is unable to initiate data transmission at the end of a shift, the PFTP shall remain fully functional and all data shall be transferred the next time a data transmission is initiated.
 - v. The Operator Role shall include sufficient permission to initiate a data transfer.

6.III-8.3 Physical Requirements - Portable FTP**8.3.1 Dimensions and Layout**

A sample mockup of each PFTP configuration and its display message sets shall be demonstrated at time of PDR. (DR 105.01 and 105.02)

8.3.2 Structural Features

- (a) The PFTP shall be to be light weight and constructed of materials suitable for transit and ferry operations.
- (b) The PFTP shall have a simple built-in keypad to allow operation of the device.
- (c) The enclosure shall be corrosion resistant and finished to resist abrasion and scratching.
- (d) The unit must be sealed and ruggedized to operate in an outdoor marine environment.
- (e) Color and type of finish shall be such that it minimizes reflections, cracking and peeling and shall be approved by the Contract Administrator during the preliminary design review.
- (f) The PFTP shall be configured such that the smart card reader is installed in the end furthest from the operator to support "arms length" card reading.

8.3.3 Carry Case

- (a) The Contractor shall supply a carry case with the PFTP.
- (b) The carry case shall be of durable construction and materials.
- (c) The carry case shall be designed to be carried on a belt.

6.III-8.4 Electrical Requirements - Portable FTP**8.4.1 Rechargeable Battery**

- (a) The unit shall be equipped with a commercially available rechargeable battery, easily replaced in the field.
- (b) The battery cover shall be removable without tools and secure under normal use.
- (c) Rechargeable battery life shall be at least 8 hours under normal anticipated operating conditions.

8.4.2 PFTP Cradle

The contractor shall provide a cradle style battery charger for the PFTP. The battery charger shall provide a regulated charge that maximizes battery life and charges PFTP batteries, at minimum, within one shift.

8.4.3 Vehicle Charger

The Contractor shall provide a charger suitable for mounting in a Paratransit or Vanpool vehicle with a standard automotive 12VDC cigarette lighter connection.

6.III-8.5 Data Exchange Requirements - Portable FTP

Data exchange requirements described in Section 6.III-3.6.1(a) are replaced by the following:

- (a) Subject to the availability of suitable communications connections, the PFTP shall be able to share the same DACS as the Stand Alone FTP's installed at Sound Transit rail platforms or DACS utilized for bus services by other Agencies.
 - (b) The PFTP shall include an Ethernet interface for connection, directly or via the 4 unit cradle to the DACS, or to an existing modem. An Ethernet connection to the 1 unit cradle shall be provided through an optional Ethernet cable adaptor.
 - (c) Depending on the option exercised by an Agency, the PFTP shall be supplied with an 802.11 wireless radio/network interface card for all wireless connections to the WDOLS at rail stations, transit bases, and at WSF and Kitsap Transit marine terminals, or with an external modem for connection using dial-up telephone lines.
- (d) The PFTP, through maintenance mode or other operational mode, shall include functionality to switch between the Ethernet and 802.11 wireless connections.
- (e) Unless directed otherwise by an Agency for its specific application (e.g. Kitsap Transit), all communications shall be automatically initiated and completed. Communications for Kitsap Transit PFTP's (and potentially PFTP's for other Agencies, depending on the application) shall be initialized manually via the use of a button or screen icon and completed automatically.
- (f) In the event of an incomplete data transfer, the PFTP shall resend all data during the next connection.

- (g) For mobile applications, all communications shall be through the supplied wireless communications interface or module. The supplied vehicle cradle/mount shall be used only for battery charging.

6.III-8.6 Additional Security Requirements - Portable FTP

The Agent or authorized operator shall be required to enter a PIN to activate the PFTP and select the required route or service the PFTP is used on.

- (a) PFTP shall generate a record of the sign on/off.
- (b) The sign on/off log shall be transferred to the clearinghouse central system daily.

6.III-8.7 Environmental Requirements – PFTP

Environmental requirements as listed in Figure III-3.2 are modified for the PFTP as follows:

- (a) Temperature range: +32°F to +110°F operating.
- (b) Humidity: 5%-80% relative humidity, non-condensing.
- (c) Minimum IP Rating: 65.

6.III-9 STAND-ALONE FARE TRANSACTION PROCESSOR

6.III-9.1 Subsystem Description - Stand-Alone FTP

Stand-Alone FTPs (SAFTP) (DR 106) shall be ruggedized devices installed at Sound Transit Stations, and King County Metro and Community Transit bus rapid transit (BRT) stations and stops, and shall be designed for pedestal or wall mounting. Two SAFTP configurations shall be supplied:

1. Configuration 1: An SAFTP equipped with zone/destination buttons for Sound Transit (DR 106.01). Passengers will select the number of zones of travel prior to presenting the fare card for payment.
2. Configuration 2: An SAFTP with no button that supports either “tag-on/tag-off” operations, or “tag-on” only operations.

At a minimum, the SAFTP shall consist of the modules listed in Figure III-9.1.

**Figure III-9.1
FTP CONFIGURATION SUMMARY**

| Modules | Stand-Alone FTP |
|--|---------------------|
| * Central Processing Unit | X |
| * Contactless Card Interface | X |
| * Customer Display/Indicator | X |
| Power Supply | X |
| Ethernet communications port (for network connection to a DAC) | X |
| Pedestal/wall mount bracket | X |
| Selection Buttons | X (Configuration 1) |

“X” denotes module required by Contract

* Module described in Section 6.III-3

6.III-9.2 Functional Requirements - Stand-Alone FTP

The following functional requirements supplement those stated in Section 6.III-3.2.

- (a) Log-on from Agency personnel shall occur via a log-on smart card, through a command issued through the DACS (to activate all FTPs at a station)..
- (b) Zone selection buttons (Configuration 1) shall allow a customer to select a destination zone. The SAFTP shall calculate the fare based on the origin and destination zones or stations.
- (c) SAFTP (Configuration 1) shall be supplied with up to 10 zone selection buttons. The final number of zone selection buttons shall be determined at PDR (CDRL 2).

- (d) The SAFTP shall support peak and off-peak fare pricing based on time of day and day of week.
- (e) SAFTP's shall be configured for either "tag-on/tag-off" operation or "tag-on" operations only, depending on the service operated on and Agency preferences.
- (f) The location identification and the agency (which indirectly selects the "tag-on/tag-off" or "tag-on" mode) shall be configured during commissioning of the device.
- (g) For tag-on/tag-off operation, the SAFTP shall deduct an initial fare (for stored value operation) upon tag-on, and provide a credit back to the card upon tag-off. For pass-products, tag-ons and tag-offs shall be registered for the purpose of ridership data collection, but no fare shall be deducted.
- (h) For tag-on only operation, a default fare shall be charged for stored value at the time of tag-on, with the amount dependant upon the fare table in effect and customer fare basis information (e.g. adult/concession fare category and any preferred zone presets). For pass products, a tag-on shall be registered for the purpose of ridership data collection but no fare shall be deducted.
- (i) Data shall be written to the card as follows to support inspection using Portable Fare Transaction Processors (PFTP's):
 - i. For tag-on/tag-off operation, the card status shall be set to "tagged in" or tagged out" depending on the action that has occurred, and PFTP devices shall read this status to determine fare payment status.
 - ii. For tag-on only operation, the fare payment transaction details shall be recorded on the card. The PFTP devices shall read these transactions details to determine fare payment status.
- (j) Transfer rules shall be as follows:
 - i. Transfers from a tag-on/tag-off transit service to a tag-on only transit service shall result in the applicable fare being on both services, subject to transfer rules in effect, regardless of whether or not the tag-off occurred on the first service.
 - ii. Transfers from a tag-on service to either another tag-on service (at an SAFTP or OBFTP), or to a tag-on/tag-off service, shall result in the applicable fare being paid on both services, subject to transfer rules in effect.

- iii. If a tag-on occurs on a BRT SAFTP and the customer also tags on to an OBFTP on a bus servicing the route upon boarding, this shall be treated as an intra-service transfer with zero fare deducted but both transactions recorded.

6.III-9.3 Performance Requirements - Stand-Alone FTP

The minimum throughput rate for SAFTPs shall be 45 transactions per minute.

6.III-9.4 Physical Requirements - Stand-Alone FTP

9.4.1 Dimensions and Layout

A sample mockup of each SAFTP configuration and its mounting shall be demonstrated at time of PDR for each mounting location. (DR 106.01 and 106.02)

9.4.2 Structural Features

- (a) The SAFTP pedestal shall be constructed of 14 gauge stainless steel.
- (b) The wall mount shall be designed for outdoor installation at an unattended site, and shall include protection against removal or vandalism
- (c) The structural design shall be such that a force of 250 pounds applied in a horizontal plane at the topmost point of the SAFTP in any of the four mutual sides shall not result in dislodging of the SAFTP, pedestal or wall mount (where installed by the Contractor), and shall not bend or buckle the SAFTP, pedestal or wall mount.

9.4.3 Keypad (zone selection buttons)

The keypad/zone selection buttons shall meet the following requirements:

- (a) All keys or buttons shall have a 10 year service life in normal operation, regardless of number of actuations. In the event that a key or button fails before the 10 year service life, it shall be replaced at no cost to the Agencies per Section 4.1 of Exhibit 14 of the Contract provided such failure does not constitute an Agency responsibility as defined in Section 4.2 of Exhibit 14.
- (b) The keypad shall be designed to be water and liquid resistant.

6.III-9.5 Data Exchange Requirements - Stand Alone FTP

- (a) SAFTPs shall include an Ethernet interface with an RJ45 connection for wired connection to a DAC.
- (b) The SAFTP shall include capabilities to be connected to a PC through a standard RS232 port for diagnostic purposes.
- (c) The Contractor shall provide the software for a PC that allows the use of a PC keyboard to operate the SAFTP and PC monitor to display the card data. This connection from the SAFTP will be provided via an auxiliary serial port that is sealed within the SAFTP mounting pole or wall cradle and accessible at a remote location within visual range of the SAFTP.
- (d) SAFTPs supplied for WSF shall include a standard serial interface, designed for future connection to WSF's new point of sale system. The Contractor shall provide an Interface Control Document (DR 106.02) fully describing this interface.
- (e) SAFTPs and associated DACs installed at Sound Transit rail stations shall communicate through Sound Transit's existing TVM communications network.
- (f) SAFTP's for BRT installations shall communicate via an Agency-supplied communications network to a designated DAC.

6.III-9.6 Installation Requirements - Stand-Alone FTP**9.6.1 Contractor Installed Mounting Hardware**

- (a) SAFTPs shall be designed to be installed freestanding on a pedestal or wall mounted.
- (b) The Contractor shall furnish to the Contract Administrator and affected Agency with bolt pattern mounting requirements, foundation designs, and electrical/communications construction and connection details.
- (c) The Contractor shall furnish one (1) set of anchor bolts and all mounting hardware, including mounting or pedestal base if required, for each SAFTP furnished under this contract.
- (d) The Contractor shall be responsible for mounting the SAFTPs with bolts or other means to a concrete surface. Each unit shall be properly leveled, accommodating station platform slopes of up to 2% traverse and 2.4% longitudinal, prior to being permanently installed.
- (e) Removal of SAFTPs shall be possible without damage to concrete or attachment devices. The attachment devices shall not be exposed to the public after the equipment is installed.
- (f) Conduit, power and communications cables leading from the power and communications sources to the junction box shall be installed by the Agency.

Connections from the junction box to the SAFTP shall be the responsibility of the Contractor.

- (g) The Contractor shall install the SAFTPs over the junction boxes, providing bottom entry of power and communication lines such that no wiring or cabling is exposed outside the SAFTP cabinet or base, and the Contractor shall make final connections (plug-in) to power and communications.
- (h) The Contractor shall perform commissioning/commissioning test services of devices as well as installation testing services.

9.6.2 Agency Installed Mounting Hardware

- (a) SAFTP's shall be designed to be installed freestanding on a pedestal or wall mounted.
- (b) The Contractor shall furnish to the Contract Administrator and affected Agency with bolt pattern mounting requirements, foundation designs, and electrical/communications construction and connection details.
- (c) The Contractor shall furnish one (1) set of anchor bolts and all mounting hardware, including mounting or pedestal base if required, for each SAFTP furnished under this contract.
- (d) The Agency shall be responsible for attaching the mounting hardware with bolts or other means to a concrete surface (pedestal) or wall (wall mount box). Each unit shall be properly leveled, accommodating station platform slopes of up to 2% traverse and 2.4% longitudinal, prior to being permanently installed.
- (e) Conduit, power and communication cables leading from the power and communication sources to the junction box shall be installed and terminated by the Agency.
- (f) The Agency shall be responsible for fitting SAFTP to SAFTP pole or SAFTP wall mount enclosure with three bolts supplied by ERG.
- (g) The Agency shall machine holes into base plates to accommodate surface mount conduit where preferred and shall fit base covers to SAFTP pole where required.
- (h) The Contractor shall perform commissioning/commissioning test services of the Agency installed devices as well as installation testing services.

6.III-10 INTEGRATION WITH SOUND TRANSIT TVMS**6.III-10.1 Subsystem Description – TVM Integration**

Sound Transit has implemented new ticket vending machines (Scheidt and Bachmann model FA 2000/TS [touch screen]) with the capability of being retrofitted with RFCS smart card equipment.

The Contractor shall be responsible for supplying RFCS hardware, software and services as described herein to support integration of RFCS smart card functionality into the TVM identified above. Specific Contractor responsibilities include:

- (a) The supply of RFCS smart card read/write equipment including reader/write devices, housings, mounting brackets, mounting hardware, and cabling as agreed with Sound Transit and the TVM Contractor (Scheidt & Bachmann) to interface with Sound Transit TVM's and provide the functionality as described herein (DR 107).
- (b) Supporting the integration of RFCS smart card read/write equipment with the credit/debit card, cash acceptance, and customer display functions of the TVM (DR 107.01) as provided by the TVM Contractor.
- (c) Integrating supplied smart card equipment with the ST communications network to provide connectivity to RFCS clearinghouse.
- (d) Providing support to Sound Transit and the TVM Contractor to confirm and document the preferred design, identify changes to TVM hardware, software and communications (including the customer interface) required to support RFCS functionality, and support system development and testing.

6.III-10.2 Functional Requirements – TVM Integration**10.2.1 Card Interface Module**

- (a) The Contractor shall provide an RFCS card interface module.
- (b) Fare cards shall be revalued using the card interface module.
- (c) The fare card interface shall use contactless technology.
- (d) The Contractor shall provide features in the card interface module for maintaining data integrity and completing the transaction through contactless interface between the card interface module and card, and between the card interface module and RFCS clearinghouse.

10.2.2 Operation and Functional Requirements

- (a) The Contractor shall provide RFCS smart card hardware, software, and interfaces to:
 - iii. Allow customers to conduct an RFCS smart card balance inquiry
 - iv. Allow customers to add value and fare products to their RFCS smart cards.
 - v. Allow RFCS smart card stored value to be used for the purchase of non-smart card fare media.
 - vi. Support smart card dispensing at Ticket Vending Machines.
- (b) The TVM (supplied by the TVM Contractor) will provide customer interface, payment, and card dispensing functionality. The Contractor shall provide RFCS equipment, messaging, libraries, drivers, and documentation as required to support integration with customer, payment and card dispensing subsystems of the TVM by the TVM Contractor.

10.2.2.1 Transaction Selection

RFCS smart card hardware and software shall provide messaging and interfaces to support selection of the following at the TVM:

- (a) Transaction type, such as add value or card value/history inquiry.
- (b) Method of payment.
- (c) Desires Agency, when more than one Agency applicable.
- (d) Whether to proceed without a receipt, regardless if a receipt is unavailable.
- (e) If a customer presents a fare card without first selecting a transaction type, the Display shall default to an inquiry response screen.
 - i. Withdrawal of the card without any further action shall cause the unit to revert to standby for the next transaction.
 - ii. Selecting a transaction after card presentation shall interrupt the balance inquiry and proceed to next logical step in executing the selected transaction.

- (f) Purchase of non-smart card fare products.
- (g) Dispensing of a permanent smart card.

10.2.2.2 Card Balance Inquiry

Functionality and interfaces shall be provided to respond to the following balance inquiry requests, and return information to the TVM for display via the customer interface:

- (a) Stored value balance on the card.
- (b) Active passes on the card, by Agency, including validity period or expiration as applicable.
- (c) Active multi-ride products on the card, including remaining rides.

10.2.2.3 Stored Value Load

Functionality and interfaces shall be provided to allow customers to add stored value to the RFCS smart card, using any payment mechanism accepted by the TVM. Functions to be provided include:

- (a) The RFCS hardware and software shall provide messages indicating the starting balance (current value) on the card for display on the TVM customer interface.
- (b) The RFCS hardware and software shall support addition of stored value in an amount selected by the customer through the TVM customer interface.
- (c) The RFCS hardware and software shall execute a stored value load only after the TVM has accepted/approved payment.
- (d) The RFCS hardware and software shall confirm that the load has been executed, and provide messaging to the TVM to display the updated stored value balance on the TVM screen.
- (e) The RFCS hardware and software shall provide messaging to the TVM and RFCS clearinghouse if a load has failed, and shall provide functionality for the customer to re-attempt the load without additional payment.

10.2.2.4 Pass or Multi-Ride Load

RFCS functionality and interfaces shall be provide to allow customers to add, through the TVM and its interfaces, pass and multi-ride products to the card using any payment mechanism accepted by the TVM. Equipment and software shall support the following:

- (a) For pass or multi-ride transactions, the customer shall select the Agency and desired fare product(s) to be purchased.
- (b) The RFCS hardware and software shall read the reduced fare privileges encoded on the card, and automatically determine whether a discount is available for the requested type of fare at the relevant Agency (e.g. youth monthly pass). If so, messages shall be returned to the TVM.
- (c) If a multi-ride product is already loaded on the card but has not been exhausted, functionality shall be provided to display of the starting balance (remaining rides) on the card for display on the TVM customer interface.
- (d) Products shall be loaded only after the TVM has accepted/approved payment.
- (e) The RFCS hardware and software shall confirm that the load has been executed, and provide messaging to the TVM to display the updated stored value balance on the TVM screen.
- (f) The RFCS hardware and software shall provide messaging to the TVM and RFCS clearinghouse if a load has failed, and shall provide functionality for the customer to re-attempt the load without additional payment.

6.III-10.3 Performance Requirements – TVM Integration

- (a) The card reader shall have a reliability of at least 50,000 mean transactions between failures on a reader processing at least 10,000 transactions per month.

6.III-10.4 Physical Requirements – TVM Integration

- (a) The Card Interface Module and any major subassemblies shall have a permanently attached label inscribed with a unique serial number and part number prominently located on the subassembly.

- (b) The card interface module and any major subassemblies shall be modular and easily replaceable with like units.

6.III-10.5 Environmental Requirements – TVM Integration

RFCS equipment shall be designed to operate within the TVM enclosure. When used as part of the TVM, it will operate to the following external environmental conditions provided in Figure III-10.1.

**Figure III-10.1
OPERATING ENVIRONMENT**

| | RFCS Equipment |
|--|---|
| Temperature Range: | +14°F to +99°F, Ambient |
| Humidity: | 5% - 100% RH |
| Shock: | Up to 5g horizontal |
| Vibration: | Same as section |
| EMI: | Same as section |
| Other (dust, grit, rain and saltwater protection): | <ul style="list-style-type: none"> • Maximum 3 inches of rain in 24 hours • Maximum 14 inches snowfall in 24 hours • Wind (70 MPH gusts) • IP55 rating. |

6.III-10.6 Data Exchange Requirements – TVM Integration

- (a) RFCS equipment shall communicate to the clearinghouse system through a network to be provided by Sound Transit. An Ethernet connection will be provided to the RFCS equipment.
- (b) Under normal operations, all data transmission shall be initiated automatically.

6.III-10.7 Installation Requirements – TVM Integration

- (a) The Contractor shall provide the Contract Administrator with a detailed installation and mounting requirements, including electrical and communications connection requirements (DR 107.04).
- (b) The Contractor shall identify requirements for any required TVM software or hardware modifications.
- (c) The Contractor shall reasonably assist the TVM vendor with determining how to best locate, install and connect RFCS hardware.

6.III-10.8 Testing Requirements and Procedures – TVM Integration

- (a) The Contractor shall be responsible for testing RFCS hardware and software supplied using a suitable test harness within a test environment at the Contractor's facilities. A TVM will not be shipped to the Contractor's facilities and all testing will be done using the test harness.
- (b) A minimum of 10,000 transactions shall be conducted.
- (c) Transactions shall be divided evenly among all possible card purchase and load transactions of which the device is capable.
- (d) The transactions shall test all possible payment combinations f as feasible in the test environment.
- (e) Stored value amounts, stored pass and multi-stored ride types and amounts, and fare amounts shall be representative of those expected to be employed in the RFCS.
- (f) Detailed information regarding the transaction types, values, and payment methods to be used in the cycling test shall be included in the Detailed Test Procedures and subject to Contract Administrator approval.

6.III-11 Customer Service Terminal (CST) & Wireless Portable Customer Service Terminal (WPCST). As specifically noted, the below requirements support the CST Application loaded on both device types, or, if the requirement supports only one of the devices, the device type is called out separately as either the CST and WPCST

6.III-11.1 Subsystem Description - CST

The CST (DR 108) shall provide the capabilities necessary for supporting RFCS through the Agency's customer service offices and for mail and phone inquiries and for remote customer outreach performed in the field using the WPCST. The Customer Service Terminal (CST) shall at a minimum provide the following customer service capabilities:

- (a) Initialize and issue all types of fare cards.
- (b) Encode personal data onto fare card and record it in the RFCS database by creating a new customer record (ORCA Account).
- (c) Using the CST, process, at a minimum, payment by cash; credit card and debit cards, electronic vouchers, checks, requisitions and purchase orders. Revalue fare cards with fare value from any Agency.
- (d) Using a WPCST, process, at a minimum, payment by cash, electronic vouchers, checks, requisitions and purchase orders. Record the credit and debit card transaction authorization code and the last four (4) digits of the credit card. Revalue fare cards with fare value from any Agency.
- (e) Process refunds and replace fare cards.
- (f) Show remaining value and pass status of card.
- (g) List the last ten (10) fare card transactions.
- (h) Block fare cards.
- (i) Unblock fare cards that have been blocked.
- (j) Provide a transaction history on each fare card by accessing the clearinghouse database, and ability to print duplicate receipts at the time of the sale.
- (k) Print receipt for each transaction or inquiry of remaining value.
- (l) Enroll customers in Autoload program.
- (m) Disable a customer's participation in the Autoload program.
- (n) Register a fare card.

- (o) Unregister a non-youth or non-RRFP fare card.
- (p) Support the sales of non-RFCS products.

6.III-11.2 Functional Requirements - CST

- (a) The CST application shall provide a means of quickly selecting “express transaction” types for the most common types of card values loaded.
- (b) The CST application shall be able to read and encode on the fare card for the initial sale and subsequent revalue actions any value up to the maximum limit, load any pass or type of ride for any Agency.
- (c) The Agency personnel shall be able to initiate the type of transaction by selecting the type of value to be loaded for a selected Agency, and origin-destination or zones if applicable.
- (d) Agency personnel shall be able to cancel a transaction at any point during the purchasing process prior to the initiation of the transfer of value to fare card.
- (e) The CST shall prompt Agency personnel to select the applicable payment type.
- (f) A transaction receipt may be printed at the CST upon request for any type of payment except when processing credit or debit transactions at a WPCST. CSTs for WSF shall print receipts for every transaction by default.
- (g) Upon the completion of the transaction selection, the CST shall calculate and display the amount due for the selected card value loaded on the operator display as well as the external customer card interface unit display.
- (h) On the same CST and shift that the original transaction occurred, the CST application shall be able to reverse the value that has been loaded on a fare card and provide an audit trail of who reversed it, including time date and terminal ID.
- (i) The CST Application shall provide mid-shift and end of shift accounting.
- (j) At the end of a sales day, the CST Application shall provide a daily summary report indicating total sales, revenue collected, passes sold, amounts of refunds issued and the number of refunds.
- (k) The daily orders received and orders filled shall be transferred to and from the clearinghouse at least once a day per Agency for the CST. For the WPCST such action will vary based on Agency provide network connectivity available to the device.
- (l) The CST shall support telephone, Internet and mail order services. The WPCST shall support Wireless Internet services only.

- i. All CST telephone, Internet and mail orders filled shall be tracked on a daily basis.
- (m) The CST Application shall provide provisions for entering customer information including name address, phone number and ID number.
 - i. The CST shall have functionality to generate customer numbers.
 - ii. The CST shall have functionality to utilize Agency-specified customer numbers.
 - iii. The CST shall have the capability to track transactions by customer number, transaction numbers, or card serial numbers.
 - iv. The CST shall allow Agency personnel to override the standard card fee, and track and report each override event.
 - v. All CSTs, revalue and information devices/systems shall reference the same customer identification information record, to avoid duplication of records for a specific customer.
- (n) The CST Application float shall be the same for the CST and WPCST.
- (o) The CST Application shall record payment method or methods for each sales transaction.
- (p) The CST shall be capable of operating commercial off-the-shelf software such as word processing and spreadsheet programs concurrent with CST functions.
- (q) CST peripherals shall be modular.
- (r) The Agencies shall have the option of procuring:
 - i. A fully configured CST designed for over the counter service.
 - ii. The CST components as described in Exhibit 9, Price Schedule.
 - iii. The WPCST commercially available laptop computer.
- (s) The CST via the MS Retail Application shall provide a report identifying inventory quantities on hand, quantities sold, and quantities added during the day.
- (t) The CST shall provide the ability to override card printing requirements when issuing a Regional Reduced Fare Permit card.

11.2.1 Cash Sales

- (a) The CST Application shall recognize cash as the default payment method.
- (b) The CST operator shall enter the amount received into the CST Application using the keyboard (the default value, obtained by

pressing enter, shall be the amount due from the customer for the current transaction) and the CST Application shall encode the fare card.

- (c) In the case of overpayment, the CST Application shall calculate the change due to the customer, display the corresponding amount on the CST operator interface screen.
- (d) Cash change shall be provided by the operator via the CST cash drawer.

11.2.2 Check, Purchase Order, or Money Order Sales

- (a) Upon receipt of a money order, purchase order (PO) or check for payment, the operator shall either scan the payment through the electronic check reader or manually enter the payment number into the CST Application using the keyboard.
- (b) The CST Application shall provide the following features when processing checks and POs:
 - i. The CST Application shall prompt Agency personnel to enter current ID, such as drivers license and expiration date.
 - ii. The CST Application shall have the ability to endorse checks and POs electronically listing the deposit information on the back of the payment, at the time the sale is made.
 - iii. The system shall have the ability to create a bad check file.
- (c) The check number shall be verified against the “bad check” and “accepted corporate check/purchase order” files resident in the CST Application.
- (d) For POs or other billing accounts, the CST Application shall record as a minimum:
 - i. Company or organization
 - ii. Billing address
 - iii. Payor contact
 - iv. Payor reference number (alphanumeric)
 - v. Agency reference number (alphanumeric)
 - vi. Notes
 - vii. Special handling instructions
 - viii. Ship-to address

- ix. Payor telephone number
- (e) Upon local verification of the check/PO at the CST, the CST Application shall send a message to the clearinghouse requesting check transaction authorization.
- (f) Such check transactions shall be processed in a manner similar to electronic payment transactions. Upon receipt of authorization, the CST Application shall notify the Customer Service Representative (CSR) of the check/PO authorization number and transfer value to the fare card.
- (g) Bad check and accepted corporate check/PO files shall be updated at the clearinghouse and downloaded on a daily basis to the CSTs or as Agency network connectivity allows for the WPCST.
- (h) Check transaction processing shall be conducted in accordance with the requirements of the authorizing financial institution/network.

11.2.3 Telephone, Mail and Internet Fulfillment and Customer Service

- (a) The CST Application shall include functionality to provide telephone, mail and Internet Customer Service and Support in a “card not present” environment.
- (b) The CST Application shall include functionality to provide Institutional Program customer service in a “card not present” environment.
- (c) The CST Application shall generate local card fulfillment orders for Internet requests processed through the RFCS Internet Website operated by the Contractor on behalf of the Agencies.
- (d) Internet website orders shall be routed to an Agency or Agencies as defined by the Contract Administrator.
- (e) The CST Application shall include functionality to create packing slips and mailing labels. Print size and font type shall meet United States Postal Service (USPS) standards.

11.2.4 Electronic Payment (Credit/Debit Card) Transactions

- (a) The customer shall perform the following steps using an external customer card interface unit:
 - i. Swipe the card to be used for payment
 - ii. Select the type of electronic payment, i.e., credit or debit card

- iii. Enter the corresponding account PIN number and press “OK” (debit transactions only)
- iv. Press “OK” to accept the amount to be charged to the corresponding account
- (b) The CST shall immediately receive the account information read from the card and the CST operator shall forward the transaction authorization request to the clearinghouse by depressing a hot key on the keyboard.
- (c) The remainder of the transaction shall be processed in a manner similar to that of electronic payment transactions at a TVM, with the exception that a duplicate transaction receipt with a signature line shall be automatically issued by the CST for all credit card transactions.
- (d) The signed receipt shall be retained in the CST cash drawer for transaction clearing purposes.
- (e) The CST shall contain provisions for the reversal of a credit/debit transaction when the transaction is canceled prior to ticket issuance or card encoding.
- (f) The processing of all credit and debit transactions shall conform to the requirements of ISO 8583.

11.25 Electronic Payment (Credit/Debit Card) Transactions (WPCST)

- (a) The CST Application on the WPCST shall be modified to only recognize a request to pay by credit card.
- (b) The CST Application on the WPCST shall be modified to only recognize a request to pay by debit card.
- (c) The CST Application on the WPCST shall record the card type (MC, Visa, Debit), authorization code, and the last 4 digits of the card number used.

11.2.6 Fare Card Inventory Management

- (a) When a new fare card is initialized, and issued the CST Application shall capture the serial number of the fare card for the clearinghouse.
- (b) The CST Application shall automatically track the card inventory of the Agency against the clearinghouse card inventory management file as fare cards are sold and initialized.

11.2.7 Customer Service Agent Sign-On/Off

- (a) For an Agent to sign on, the following procedure shall be followed. Additionally, the Agent shall be required to unlock the CST cash drawer with a key to gain access to the drawer. The Contractor shall provide to the Contract Administrator five (5) sets of all CST keys a minimum of 60 days prior to the delivery of the first CST.
- (b) Agent enters their PIN.
- (c) Agent tags their valid operator smart card. The CST Application shall compare the PIN encoded on the smart card with the PIN entered and the CST shall only be operable when the two match.
- (d) The CST Application shall be able to track incorrect Operator sign-on attempts, and shall block the Operator card after a configurable number of failed attempts.
- (e) The CST Application shall automatically record all operator sign-on and sign-off attempts. Locking the CST cash drawer shall have no effect on Agent's data. If an Agent has not signed off, the sign-on of a subsequent Agent shall cause an automatic sign-off for the first operator without loss of any data.
- (f) The Agent shall be able to key in the working cash fund that is available at the start of their shift and to have the CST Application keep a running balance throughout the shift by accounting for cash received for any cash sales.

11.2.8 CST Systems Administration Mode

Through commands entered using the Agent interface such as the keyboard or touch-screen, authorized maintenance and/or revenue service personnel shall be able to place the CST Application into Systems Administration Mode.

- (a) The CST Application shall have a maintenance and systems administration mode function.
- (b) When in Systems Administration Mode, the customer interface display shall read "Out-of-Service" and the operator interface shall be used to enter commands, perform queries, and receive information from the machine on both the monitor screen and on audit.
- (c) The CST Application shall not be capable of loading value onto a smart card when in the maintenance mode.

- (d) The CST Application shall return from the Systems Administration Mode to revenue service after servicing.

11.2.9 CST Training Mode

Through commands entered using the Agent interface such as the keyboard or touch-screen, authorized Agency personnel shall be able to place the CST Application into Training Mode.

- (a) In Training Mode, the CST Application shall simulate normal operation including actual display messages
- (b) In Training Mode the CST Application shall on be capable of loading value onto the cards issued as special Training Cards, and that these training card cannot be used with the operational system.
- (c) A record from the time the CST Application entered Training Mode to the time returned to normal operation shall be created and transferred to the clearinghouse central system during the next scheduled data off load cycle.

11.2.10 Non-RFCS Sales

- (a) The CST Application shall have functionality to process, record and report the sales of non-RFCS products.
- (b) The CST Application shall have the ability to track the inventory of used, unused, sold, and on-hand non-RFCS products in the system by using barcode or manually entered serial numbers.
- (c) The CST Application shall provide local inventory and revenue reporting of the sale of non-RFCS products.
- (d) The CST Application shall provide a combined report of all revenue collected and payment methods used to support single deposit. Revenue reports shall distinguish between RFCS and non-RFCS product sales, amounts and payment methods.

6.III-11.3 Performance Requirements – CSTand WPCST

11.3.1 Reliability

- (a) The following reliability rates, Mean Transactions Between Failure (MTBF), shall apply for a high transaction volume environment: 10,000 MTBF.
- (b) Reliability shall be measured as follows:

- i. For the CST, the reliability shall be 5000 Mean Operating Hours Between Failure (MOHBF) in a low transaction volume environment.
 - ii. For the WPCST, the reliability shall be 720 Mean Operating Hours Between Failure (MOHBF) in a low transaction volume environment.
- (c) High and Low Volume Transaction environments are defined in Section 6.III-1.5.1 (a) and (b).
- (d) Any component or assembly within a CST that fails more than two (2) times per month shall be replaced with a new component or assembly.
 - i. If the new component or assembly experiences the same failure rate, the Contractor shall be responsible to initiate an investigation to determine the cause.
 - ii. Alternatively, failures shall average no more than two (2) failures per device type every 90 days for the total population for each type of CST in revenue service.

11.3.2 Availability (CST)

Availability shall be measured at a minimum for the following:

- (a) The CST shall be available to conduct a transaction 99.73% [σ σ (second sigma)] during operating hours.
- (b) Credit or debit card authorization shall be available as specified in Section 6.III-1.5.2, "Availability."
- (c) CSTs shall be available to transmit data upon request to the clearinghouse 99.73% [σ σ (second sigma)] during the scheduled time periods for these activities (refer to Section 6.III-1.5.2 "Availability").
- (d) Contractor shall provide a detailed plan that describes the methodology of capturing and processing the data to be used to measure availability (CDRL 39).

11.3.3 Accuracy

- (a) Accuracy shall be measured as shown below. Accuracy for all types of electronic payments is defined as the mean ratio of the transactions value recorded by the device as evidenced by the

transactional data recorded to the actual transaction records received and processed by the clearinghouse.

- i. For the CST, the electronic payments functions shall have an accuracy rate of 99.73% (σ σ sigma).
 - ii. For the WPCST, the electronic payment functions shall have an accuracy rate of 99.9% to 100.01%.
- (b) The cash transaction functions shall have an accuracy rate of 99.5%.

Accuracy for the cash processing functionality is defined as the mean ratio of the moneys recorded as evidenced by the audit receipts produced by the device to the actual moneys in the bill and coin vaults as counted. Cash reconciliation differences attributable to beginning inventory shortages or loading errors shall be excluded. Differences attributable to counting errors shall also be excluded. Reconciliation differences shall be reported by relevant device within 24 hours.

6.III-11.4 Physical Requirements - CST

- (a) The full-function CST shall contain the modules listed in Figure III-11.1.
- (b) Agencies shall have the option of procuring CSTs with any combination of peripherals for mail, telephone or other applications that may not require all peripherals.
- (c) Agencies shall have the option of procuring additional peripherals as illustrated in Figure III-11.2

**Figure III-11.1
CST MODULE SUMMARY**

| Module | CST Reference | WPCST Reference |
|--|----------------------|------------------------|
| CST CPU (DR 108.01) | X | |
| WPCST Ruggedized CPU | | X |
| Magnetic Card Reader (DR 108.02) | X | |
| PIN pad (DR 108.03) | X | |
| Agent Display (DR 108.04) | X | |
| Customer Display (DR 108.05) | X | |
| Fare Card Reader/Writer (DR 108.06) | X | X |
| Keypad/board (DR 108.07) | X | |
| Printer-Receipt (DR 108.08) | X | X |
| Cash drawer (DR 108.09) | X | |
| Secure Access Module (SAM) (DR 108.12) | X | X |

“X” denotes module required by Contract

**Figure III-11.2
CST – ADDITIONAL MODULES**

| Module | CST Reference | WPCST Reference |
|--|----------------------|------------------------|
| Photo ID Equipment (DR 108.10) – camera & power supply | X | X |
| Card Dispensing Module (DR 108.11) | X | |

11.4.1 Customer Service Terminal and Wireless Portabel Customer Service Terminal

11.4.1.1 The Customer Service terminal shall consist of:

- (a) CPU, based on the latest generation of Intel or Motorola microprocessor or approved equivalent and shall be configured with sufficient memory, data storage, and appropriate communications to meet the functional requirements defined for the terminal. Unless otherwise required for the provision of drive bays or interface cards, the CPU shall be supplied in a mini-tower configuration. If a larger housing is required to accommodate additional drive bays or interface cards, the CPU shall be supplied in a tower configuration.
- (b) Full function keyboard or touch screen interface.
- (c) Minimum 17 inch standard PC active matrix LCD monitor. The monitor shall be readable in all ambient light conditions, including both day and night. The display shall be subject to the review and approval of the Contract Administrator (DR 108.04). Due to space constraints at customer service offices, some Agencies may require 15 inch LCD monitors in lieu of 17 inch monitors. This will be determined at Preliminary Design Review (CDRL 2). The CST shall be designed to operate with either a 15 inch or 17 inch monitor.
- (d) Default selections on the key board or touch screen shall be provided to speed up the transaction process for commonly used transactions.

- (e) Receipt printer.
- (f) Locked cash drawer.
- (g) A customer display to provide the transactional information to the customer.
- (h) The CST interface shall be subject to Contract Administrator review and approval (DR 108.04).
- (i) Fare Card Reader/Writer.
- (j) Printer-Receipt

11.4.1.2 The Wireless Portable Customer Service Terminal shall consist of:

- (a) Ruggedized laptop computer shall be configured with sufficient memory, data storage, and appropriate communications to meet the functionality requirements defined for the WPCST.
- (b) Printer-Receipt.
- (c) Fare Card Reader/Writer.

Figure III-11-3

WPCST CPU Configuration

| Item | Specification |
|------------------------------|--|
| a. Processor | Intel Core i5-2520M, 2.50GHz, 3MB Cache |
| b. Memory | 4.0GB, DDR3-1333MHz SDRAM, 1DIMM |
| c. Hard Drive | 250GB Hard Drive 7200RPM |
| d. Serial Ports | 1 x RS232 |
| e. USB Ports | 5 ports (USB Hub) |
| f. Keyboard and Mouse | USB or wireless (optional) |
| g. Network | 10/100Base-T Ethernet/WLAN (802.11b/g/n) |
| e. Power Supply | 100-240 VAC, output rating 250W |
| f. Rugged Features & Testing | MIL-STD 810G shock, vibration, temperature, altitude, and humidity IEC60529 IP5X for dust |

| | |
|--------------------------------|---|
| g. Environmental Specification | Operating Temp: 0 to 60 degrees C (32 to 140 degrees F) Storage Temp: -51 to 71 degrees C (-59 to 159 degrees F) |
|--------------------------------|---|

Figure III-11-4

WPCST Required Software Components

| Peripheral Device Function | | |
|---|--|--------------------------------|
| (a) | Windows XP | 3 rd Party Supplied |
| (b)) | MS Retail v2.0 | 3 rd Party Supplied |
| (c) | Trend Micro Enterprise Security for Endpoints Advanced | 3 rd Party Supplied |
| (d)) | SQL Server 2000 CALs | 3 rd Party Supplied |
| (e) | Contractor CST Application | Contractor Supplied |
| Support Components/Device other than those supplied with peripheral device | | |
| (f) | Wireless Modem | Supplied by service provider |

11.4.2 Customer Interface Unit

The customer interface unit shall consist of the following:

- (a) Customer data entry/PIN pad connected to the CST via a flexible cable.
- (b) The pad shall be a DES/UKPT encrypting numeric keypad for PIN entry.
- (c) EMV compliant magnetic stripe card reader.
- (d) Privacy hood or shield to protect the privacy of PIN code entry.
- (e) Display to prompt the customer and to indicate the amounts being charged to their credit or debit cards. The display shall indicate that PIN entries are being made with * but shall not record the characters being entered.

11.4.3 Cash Drawer

The CST shall provide a uniquely keyed, lockable cash drawer attached to or detached from the CST unit.

- (a) The cash drawer shall be designed and constructed to be pry-proof to prevent unauthorized entry when closed and locked.
- (b) If a separate device from the CST, the cash drawer shall withstand a drop on any corner or side from a height of 2.5 feet onto a concrete floor when containing a full compliment of bills and coins.
- (c) The drop incident shall not cause the cash drawer to open and shall leave the drawer operational.
- (d) The drawer shall contain a removable subdivided tray for currency, coin, checks and other documents received by the operator.
 - i. The tray shall have the capacity to separately store a minimum of 80 bills of each of 4 US currency denominations and a minimum of 60 coins of each of 5 US coin denominations (including SBAs, quarters, dimes, nickels, and pennies) in compartments sufficiently sized for these items.
 - ii. The tray shall also contain two compartments of 4 inches by 6 inches and a minimum of 1 inch deep to accept paper documents.

11.4.4 Receipt Printer

The CST and WPCST shall include a Receipt Printer as an integral part of the device or as a stand-alone device that interfaces with the CST or WPCST through a standard communications port.

- (a) The receipt printer shall include a roll-type receipt paper feed a thermal printer.
- (b) Receipt information shall be software programmable.
- (c) Each Receipt Printer shall be configured to print duplicate receipts with signature lines for credit card transactions.
- (d) Printed characters shall be in black print, smudge resistant when handled immediately by the operator or customer.
- (e) Receipt printing for any type of transaction shall take no longer than 4 seconds.

11.4.5 Photo Identification System

The CST and WPCST shall include capabilities to print a photo on to special fare cards categories in support of the RRFP or other photo/ID programs.

- (a) The photo identification (ID) system shall consist of the following components:
 - i. Digital camera.
 - ii. Application software.
 - iii. Card printer.
 - iv. Card lamination unit, if required.
- (b) The photo ID system shall process and print the image on to the fare card at a maximum of five (5) minutes.
- (c) Once the printing process is completed the image shall be smudge proof and permanent for the life of the fare card. The image may be laminated with a clear plastic sheathing as protection.
- (d) The photo ID system shall be able to operate on CST and WPCST hardware platforms.
- (e) A single photo ID system shall be accessible from multiple CSTs through an Agency's network when operated in an Agency CSO.
- (f) For the WPCST, transfer of digital photographs from a digital camera in the field, and association of the photographs with the corresponding customer records.
- (g) For the WPCST, transfer captured data and images to the RFCS clearinghouse upon connection of the laptop computer to the RFCS network at the Agencies facilities.

11.4.6 Card Dispenser

- (a) The card dispenser shall be capable of independently distributing two (2) different card products including the fare card and disposable fare card.
- (b) The card dispenser shall be housed in a secure, lockable housing.
- (c) A means shall be provided for keeping the card stock unexposed and secure at all times outside of card stock replacement actions.
- (d) Each card dispenser magazine shall be capable of holding a minimum 300 fare cards.

- (e) The cards shall be dispensed in an automatic fashion upon the receipt of payment at the CST for a smart card sales transaction.
- (f) Dispensing time shall be one (1) second or less.

6.III-11.5 Electrical Requirements - CST

In the event of a power interruption, a rechargeable dry or sealed gel cell battery source (or UPS) shall provide auxiliary power to the CST for a minimum of 10 minutes of full operation. And at the end of the 10 minutes, complete the transaction in progress and allow for orderly shutdown of the CST, including transmitting all audit data and alarm conditions to the clearinghouse.

6.III-11.6 Environmental Requirements – CST and WPCST

The CST and WPCST shall be designed to operate in the environmental conditions provided in Figure III-11.5.

**Figure III-11.5
OPERATING ENVIRONMENT**

| | Customer Service Terminal Standard | Wireless Portable CST |
|--|---|---|
| Temperature Range: | Climate controlled office environment and WSF toll booths | See Figure III-11.3 (g) |
| Humidity: | Climate controlled office environment and WSF toll booths | See Figure III-11.3 (f) |
| Shock: | Minimum 20g non-operating, 2.5g operating. | See Figure III-11.3 (f) |
| EMI: | Applicable FCC requirements | <ul style="list-style-type: none"> • Applicable FCC requirements • 3rd Party equipment – Manufacturers' EMI specifications |
| Other (dust, grit, rain/water protection): | Climate controlled office environment | See Figure III-11.3 (f) |

6.III-11.7 Data Exchange Requirements – CST and WPCST

- (a) CST event and transaction data shall be transferred to/from the clearinghouse via a Agency provided communications network.
- (b) WPCST event and transaction data shall be transferred to/from the clearinghouse via the Agency's communication network.
- (c) Data back-up features shall be included to maintain the integrity of all data stored in the CST Application in the event of system or component failure.

6.III-11.8 Installation Requirements – CST and WPCST

- (a) The Contractor shall install and setup all elements of the CSTs in the designated customer service offices.
- (b) To the extent practical, the CST equipment shall be secured to prevent theft or damage.
- (c) The Contractor shall make all connections to power and communications, all connections between CST elements, and route all cables neatly and out of the way.
- (d) The Contractor shall install the WPCST and its peripherals to an Agency-provided portable cart.

6.III-11.9 Additional Security Requirements - CST**11.9.1 Alarms**

- (a) The CST shall be provided with an alarm that notifies the clearinghouse when an unauthorized entry occurs.
- (b) Both the alarm and method of activation/deactivation shall be subject to Program Manager approval.

11.9.2 Keys

The Contractor shall provide to the Contract Administrator five (5) sets of all CST keys a minimum of 60 days prior to the delivery of the first CST.

6.III-11.10 Agency Specific Requirements

11.10.1 (This section intentionally left blank. Section deleted per Change Order No. 5)

11.10.2 Portable CST Application (Option) (NOTE – Section deleted per Change Order No. 49) Requirements included in CST section 6.III-11

6.III-12 DATA COLLECTION SYSTEM**6.III-12.1 Subsystem Description - Data Collection System**

The data collection system (DR 109) shall consist of distributed data acquisition computers (DACs) throughout the region. DACs collect the data from On-Board, Portable and Stand-alone FTPs, GAKs or other designated RFCS equipment for transfer to the clearinghouse and provide the relevant Agency with duplicate data files of the data files transferred to the clearinghouse.

6.III-12.2 Functional Requirements - Data Collection System

- (a) The application program shall use an MS Windows standard graphical interface.
- (b) The use of proprietary hardware and/or software shall be subject to Contract Administrator review and approval.
- (c) The DAC shall operate without manual intervention.
- (d) All data up and down loading to the clearinghouse or to On-Board, Portable and Stand-alone FTPs shall be fully automated.
- (e) The DAC clock shall be synchronized with the clearinghouse clock prior to beginning a data transfer.
- (f) The Agency DAC shall allow access to a rolling 90 day database of complete trip transaction records for the Agency through the clearinghouse.
- (g) The DACS shall interface to the clearinghouse through the Back Office Client Computer per Section 6.III-13.

6.III-12.3 Performance Requirements - Data Collection System

- (a) The Contractor shall provide a detailed plan that describes the methodology of capturing and processing the data to be used to measure availability (DR 109.01).
- (b) This plan is subject to Contract Administrator review and approval.
- (c) The Contractor may add equipment or increase system redundancy levels in order to meet or exceed availability requirements.
- (d) System availability shall be measured at a minimum for the following:
 - i. DAC shall be available to transmit data to the clearinghouse 99.73% and to on- and off-load the data from the FTPs 99.73% during the scheduled time periods for these activities.

- ii. The combined system elements such as FTP, WDOLs, DAC, and clearinghouse system shall be available 99.73% of the time when they are required for system operations.

6.III-12.4 Physical Requirements - Data Collection System

12.4.1 Data Acquisition Computer

- (a) The DACS shall consist of standard PC components with minimum requirements as follows:

| Component | Requirements |
|------------------------|---|
| CPU | Intel Pentium 4 or Xeon, operating at ≥ 1.5 GHz. 1U or 2U rack configuration |
| | |
| Network Interface Card | 10/100 Mb/s Ethernet NIC |
| | |
| RAM | ≥ 512 Mb |
| | |
| Hard Drive | ≥ 40 Mb, 7200 RPM |
| CD ROM | $\geq 48x$ |
| Removable Media | CD R/W with software to write large data files across multiple CD's |
| Operating System | Windows-based (NT, 2000, 2003, XP Professional) |

- (b) The applications shall be programmed in high order languages such as JAVA, Visual Basic, or C++ and distributed objects.
- (c) Equipment will be installed in a secure location.
- (d) Each DAC shall have sufficient hard disk space to hold a minimum seven days of transactions.

6.III-12.5 Electrical Requirements - Data Collection System

- (a) The requirements specified in Section 6.III-1.5. shall be met.
- (b) In the event of a power interruption, a rechargeable dry or sealed gel cell battery source (or UPS) shall provide auxiliary power to the DAC for a minimum of 30 minutes of full operation; and shall allow for an orderly shutdown of the DAC, including completion of the transmission of all audit data and alarm conditions to the clearinghouse.

6.III-12.6 Environmental Requirements - Data Collection System

DAC shall be designed to operate in the environmental conditions provided in Figure III-12.1.

**FIGURE III-12.1
OPERATING ENVIRONMENT**

| | Data Acquisition Computers |
|--|--|
| Temperature Range: | Climate controlled environment |
| Humidity: | Climate controlled environment |
| Shock: | Minimum 20g non-operating, 2.5g operating. |
| EMI: | Applicable FCC requirements |
| Other (dust, grit, rain/water protection): | Climate controlled environment |

6.III-12.7 Data Exchange Requirements - Data Collection System

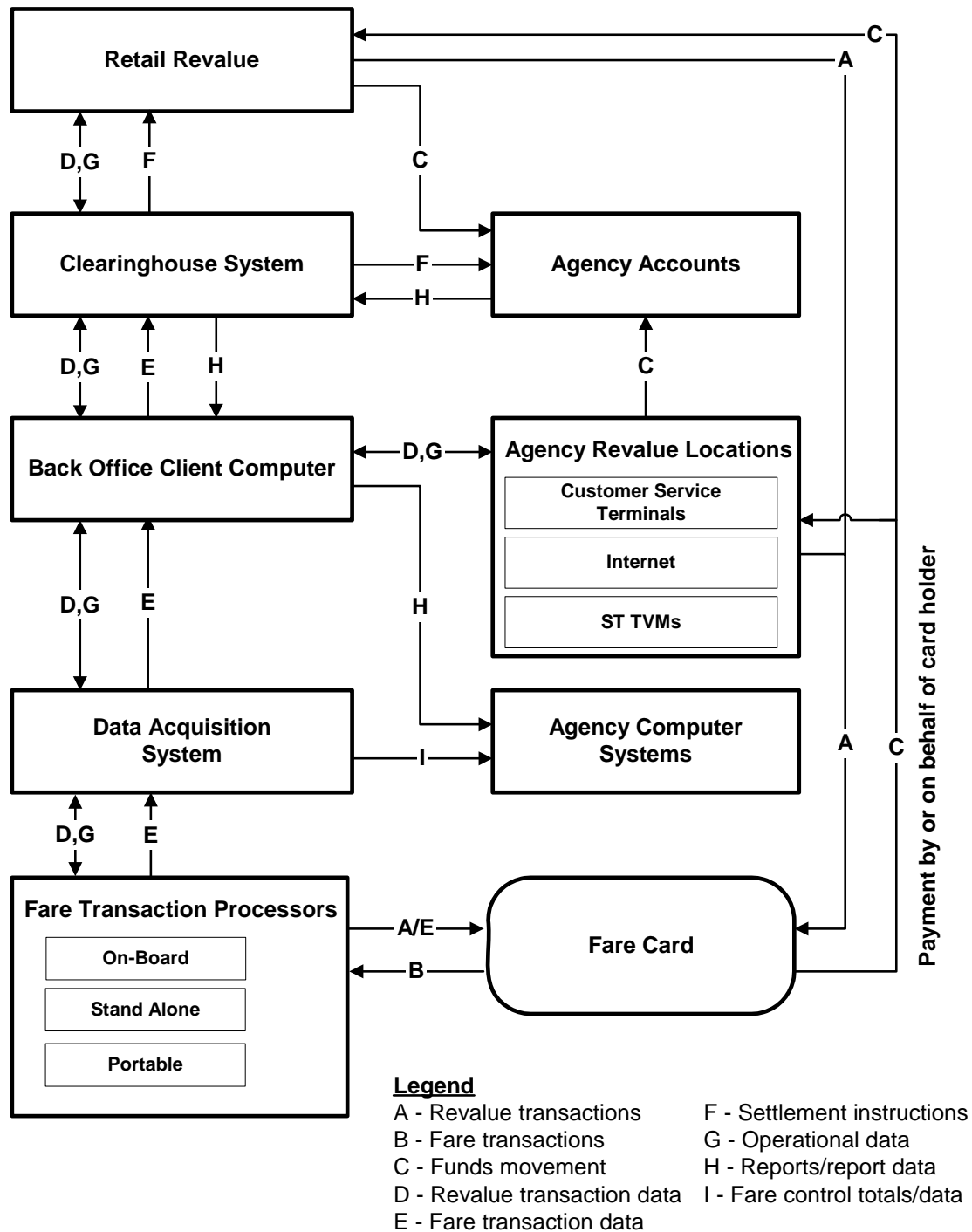
12.7.1 RFC system Architecture

- (a) The Contractor shall develop a comprehensive RFC system Architecture, reflecting the interface requirements shown in Figure III-12.2.
- (b) The System Architecture shall include optional or alternative elements to be implemented in the future, as defined in this RFP or proposed by the Contractor. The Contractor may also propose additions to the core system architecture such as the provision of a headquarters computer.
- (c) The System Architecture shall be submitted with the design documentation and shall be approved by the Contract Administrator.

12.7.2 Data Communications

- (a) The DACS shall communicate with the clearinghouse. Asynchronous communication using File Transfer Protocol (FTP) over TCP/IP at 56 kbps or greater shall be provided.
- (b) All batches shall be tagged with DACS header information including as a minimum DACS ID, date stamp, and time stamp.

Figure III-12.2
REVALUE DEVICE AND COMPUTER SYSTEMS
INTERFACE REQUIREMENTS



- (c) The DACS shall be equipped with required data communications interfaces including modem or network cards.
- (d) Under normal operations, all data transmission shall be initiated automatically.
- (e) Uploading of data from designated equipment to the DAC shall occur on a timed poll basis, at a minimum daily, or when equipment memory is at a predetermined threshold level.
- (f) Download of data to designated equipment from the DAC shall occur at Agency pre-determined times of-day. The DAC shall have the capability to mirror the FTP displays in real time or allow the FTP transaction to be remotely monitored.
- (g) DACs installed at Sound Transit rail stations shall communicate through the existing TVM communications network.

6.III-12.8 Installation Requirements - Data Collection System

- (a) The Contractor shall install and setup all elements of the DAC in the designated Operating Bases and Agency offices.
- (b) Each Agency is responsible to provide a secure location for the equipment to prevent theft or damage.
- (c) The Contractor shall make all connections to power and communications, all connections between DAC elements, and route all cables neatly and out of the way.

6.III-12.9 Additional Security Requirements - Data Collection System

- (a) Every access, authorized and unauthorized, to the DAC shall be logged and reported.
- (b) Data maintained by the DAC shall be protected from loss, manipulation, and/or disclosure through access control and cryptographic data integrity checking mechanisms. Any secret or private data shall be encrypted.

6.III-13 BACK OFFICE DATA INTEGRATION

6.III-13.1 Subsystem Description

Back office data integration shall include a client application (DR 110) to provide standard revenue and ridership reporting, RFC system reporting, Agency-specific reporting, ad-hoc query reporting, and fare table update functionality. The client application will provide the primary data interface to the clearinghouse system, and will contain functions for the generation of reports and transfer of data to legacy systems. The client application will also allow consolidated reports to be generated using fare card and non-fare card data transferred both from the clearinghouse system and directly from the data acquisition system (non-fare card data recorded by the FTPs).

The client application shall be designed to operate on a standard PC-based workstation at each Agency (either provided by the Agency or provided under this Contract). Communications to the clearinghouse system shall be via LAN/WAN or other means (e.g. asynchronous dial-up). The Agencies are interested in solutions that leverage off modern client-server or N-tiered application development technology.

The Client Application (in conjunction with local server if applicable) shall support the following high level business functions:

1. **Revenue Information and Reconciliation** - This is the information typically needed daily for posting to the Agencies General Ledger application. Some Agencies require categorized totals for manual entry to the GL (e.g. 8 - 10 data points representing sales by pass type, and realized e-purse revenue by fare type). Other agencies require transaction level revenue data.
2. **Ridership Information and Processing** - This is information on fare card use, provided at the transaction level, or summarized daily, weekly, monthly, quarterly or other period, used by each Agency to report ridership characteristics for local and regional reporting.
3. **System Performance Reporting** - This is information about the performance of the RFC system including management information reports such as financial management, customer service, inventory systems operation, and system status/maintenance reports such as fault tracking, exceptions, and support service statistics.

The client application shall include a data export functionality to export/transfer data from the clearinghouse system and DACS to each Agency's legacy revenue and/or ridership systems. This functionality could be implemented via industry standard software techniques such as batch-automation, real-time connectivity, or manual data entry, depending upon the system integration requirements of each participating

Agency. This will allow the Agencies to generate custom reports with their existing back-office systems.

Flexibility and extensibility is also required to allow the creation of new reports, modify existing reports, and administer new types of fare tables to support new fare policies such as distance based fares.

6.III-13.2 Functional Requirements

13.2.1 Back-Office Client Application

- (a) The client application for the back-office system integration is designed to be the common data-management solution for all participating Agencies. The client application functional requirements shall complement the Agency specific integration functional requirements.
- (b) The Contractor shall be responsible for providing workstation hardware and software for the client application at each Agency.
- (c) The back-office client application shall include capabilities for an agency to correct erroneous data or reports, and update clearinghouse and other databases and reports automatically. This does not include changing revenue data.

13.2.1.1 Clearinghouse Data Reporting

The Contractor shall develop reports as specified in 6.III-13.3, Data Exchange and Reporting Requirements. All reports shall be generated by the back-office client application.

13.2.1.2 Agency Specific Fare Table Administration (DR 110.01)

- (a) The back-office client application shall administer and electronically transfer fare table data to the clearinghouse. The following list of properties is provided as a guideline for the Agency's fare table input, and subsequent transfer to the clearinghouse:
 - i. Agency I.D.
 - ii. Unique Fare ID Reference
 - iii. Description String of Fare Type
 - iv. Start Date/End Date
 - v. Fare Amounts
 - vi. Rider Demographic Category fare rules
 - vii. Rider Peak/Off-Peak fare rules

- viii. Rider Frequency-based fare rules
 - ix. Rider Day-of-Week fare rules
 - x. Rider Holiday fare rules
 - xi. Inter-Agency Rider commute fare rules
- (b) The back-office client application shall administer existing fare tables, and shall be extensible to administer new local and inter-system fare tables.
 - (c) The back-office client application shall administer a minimum of three (3) fare tables: Prior, current and those for the next fare or service change.
 - (d) The client application shall have read-only access to the fare table from the preceding service period.
 - (e) The client application shall include functionality to test fare tables prior to forwarding to the clearinghouse.

13.2.1.3 Agency User Administration

The back-office client application shall provide the following user administration functions:

- (a) Add new Agency user
- (b) Update Agency user
- (c) Remove Agency user
- (d) Disable Agency user

13.2.1.4 Agency Application User-Defined Environment Views

The back-office client application shall provide the following user defined environment views:

- (a) Standard User View - Whereby the user will be only able to view a standard Agency operational view of data and application features.
- (b) Standard Power User View - Whereby the user will be able to view a standard Agency managerial view of data and application features.
- (c) Standard Administrator View - Whereby the user will be able to view a standard Agency RFCS back-office integration administrative view of data and application features.

- (d) Customized View - Whereby the user can configure the application to show only user-relevant information in which they are permitted to interact with based on their security clearance level.

13.2.1.5 Import/Export Report Data

The back-office client application shall provide the following data import/export functions. All functions shall be available for all report categories specified in 13.3:

- (a) Data Files (Import Source / Export Destination) - This option will include the ability to specify input or output file format including, but not limited to Comma Delimited, User Defined Delimiters, Fixed Field Width, and XML (a tagged data format).
Note: The XML export option will support the direct republishing of summary information on an Agency Intranet, or the Internet (in the case of information open to the public). Specifications and additional information on XML can be obtained from <http://www.w3.org/xml>.
- (b) DSN Resource (Import Source / Export Destination) - This option will facilitate the transfer of data from the clearinghouse to Agency's local systems. In this function the user shall be able to specify a target Data Source Name (DSN) and table. The system shall accept a user-defined compatible DSN (column count, and data types) for the destination table. The interfaces for this function shall accept user input of any DSN entries configured on the workstation via the Windows control panel, or equivalent workstation interface.
- (c) Printing (Export Destination) - The user will be able to select from a list of printers configured for the client application's operating system. Connection to the printer may either be direct (serial or parallel) or via a local area network (LAN). The client application should take advantage of Operating System print servers to maximize the number of printers compatible with the application.

13.2.1.6 RFCS Database Connectivity

- (a) The Contractor shall provide connectivity to the clearinghouse database that meets all the requirements for access and performance described in this document.
- (b) The Contractor shall provide a connection strategy that is consistent with modern wide-area computing technology. Whenever possible the Contractor shall utilize industry standard technology (connectivity hardware, communications protocols, replication technology, etc.).

- (c) The Contractor shall provide failure analysis documentation for the proposed connectivity strategy. This document will address emergency recovery plan, and emergency (or "off-line") operation procedures.
- (d) The system shall notify the Agency system administrator of communications failures to the clearinghouse system.
- (e) The client application shall not remove, delete or alter data records at the clearinghouse system.

13.2.1.7 RFCS Database Archive Administration

This feature allows archiving of data transferred to the client application; it does not include archiving or modification of data at the clearinghouse system.

- (a) The Contractor shall provide an archive function to provide the Agency with off-line or near-line storage of historical information. The back-office client application shall provide the following database archive functions:
 - i. Agency-specific archive. The system shall allow data to be archived weekly, monthly, and quarterly (3 months) to the target media. The archive scheduling shall be programmable by each Agency.
 - ii. Inter-Agency Archive Subset. This will archive Inter-Agency information to the target media. The Agency may wish to keep Agency-specific historical information on-line longer than Inter-Agency information.
- (b) Records in an archive set shall be flagged or stamped with the current date and time. Incremental archiving shall be provided.
- (c) Each Agency will be responsible for implementing the administrative duties of the archival process. The archive function shall support industry standard media (tapes, disks, CD's) typical for the workstation architecture and operating system.

13.2.1.8 Inter-Agency Data Sharing Filter Administration

The back-office client application shall provide the following inter-Agency data sharing filter administration functions. These are features of convenience, designed to allow the user to display or hide data in a specific view.

- (a) {Display | Hide} All Agency Public records
- (b) {Display | Hide }Specified Agency Public records

- (c) { Display | Hide } Specified Agency Private records
- (d) { Display | Hide } Specified Inter-Agency records

13.2.1.9 Event Logging

The back-office client application shall provide the following event logging functions. The log entries shall occur automatically, and without user intervention:

- (a) Agency Fare Table Administration Events
- (b) Pass Sales Transactions
- (c) Agency User Administration Events
- (d) Batch Scheduled/User Executed Report Generations Events
- (e) Performance metrics for report generation/data sharing events
- (f) Data Import/Export Events
- (g) Database Query Errors
- (h) User Security Events
- (i) Inter-Agency Data Sharing Administration
- (j) Inter-Agency Data Sharing Transactional Events
- (k) Clearinghouse data transactions

13.2.1.10 Local Fare Card Revenue Control Total Reporting

The definition of the control total reporting method is a one to one aggregate comparison between totals from the DACS set of revenue detail records and the totals from the clearinghouse set of revenue detail records for a particular Agency business day. The difference between DACS revenue total and the clearinghouse revenue total is defined as the control total variance. Control totals provide an approximation of fare collection revenues owed to an Agency, but are not expected to represent true revenue owed once all transactions have been reconciled.

- (a) The back office client application shall include functionality to process and report total reconciled and un-reconciled fare card revenue collected at each Agency.
- (b) Reports shall be provided on a daily basis.

- (c) The back office client application shall compare control totals received from the DACS with reconciled totals received from the clearinghouse on a daily basis.
- (d) The back office client application shall create a variance report and report the source of the variance.
- (e) The back office client application shall activate an alarm if a control total variance exceeds a user-defined threshold.

13.2.1.11 Consolidated Fare Card and Non-Fare Card Ridership Reporting

- (a) Some Agencies will collect non-fare card data through the fare transaction processors. The back-office client application shall include functionality to process and generate consolidated ridership reports for all fare card and non-fare card data recorded on the fare transaction processors.
- (b) The back office client application shall include functionality to correct "double counting" of fares that include a fare card underpayment, coupled with a non-fare card "upgrade".

13.2.1.12 Ad-Hoc Reporting

The back-office client application shall include the following ad-hoc reporting functions.

- (a) A graphical interface for the creation of the database query. The user can choose table(s), field(s), conjunctions, conditionals, and output order (ascending or descending). The user can select one or two field(s) for "Group-by" to organize the results in a hierarchy (e.g. report on annual pass sales per month group-by 'sales-location').
- (b) A query editor that allows the user to create a new query using a standard structured language. This same interface may be used to edit a query that was built from the graphical query builder.
- (c) A graphical interface for the creation of the report formats. The user will be able to define page size, margins, footers, headers, page breaks, font size and style, and simple graphical elements.
- (d) A function to save a report design for future execution, or editing.
- (e) A query batch submission service feature, which would enable the Agencies to have query/report results, sent to the submitting Agency via standardized digital media (e.g. DAT tapes). This service would reduce network bandwidth usage and improve data accessibility.

13.2.1.13 Business Day

- (a) The Contractor shall coordinate the upload and download of data based on each Agency's administrative business day.
- (b) The Contractor shall be able to handle changes to the Agency's administrative business day. This may require coordination with an event triggered by the Agency (as opposed to a time table system).

13.2.2 Functional Requirements (Agency Specific)

The Contractor shall develop the Agency client application to meet the following requirements:

- (a) Provide reports/data for integration into existing Agency reports and databases.
- (b) The client application shall be integrated with the following legacy systems:
 - i. King County Metro, ASCII data file or direct ODBC connection to a workstation to be provided by KCM.
 - ii. Washington State Ferries, integration with new revenue collection system as described in 6.III-16.7.
 - iii. Kitsap Transit, ASCII data file transfer.
 - iv. Pierce Transit, Oracle DBMS and Microsoft SQL RDBMS.
 - v. Community Transit, Oracle DBMS.
 - vi. Everett Transit, no legacy system.
 - vii. Sound Transit, Central Data Collection System (CDCS - under development).
- (c) The Contractor shall coordinate with Agency personnel and other contractors supporting legacy systems as listed in Figure III-13.1.
- (d) The Contractor shall be responsible for developing the client application such that it is compatible and integrated with existing systems.

Figure III-13.1
LEGACY SYSTEM SUPPORT CONTRACTORS/PERSONNEL

| Agency | Contractor |
|--------------------------|---|
| King County Metro | KCM staff |
| Kitsap Transit | KT staff |
| Pierce Transit | PT staff |
| Community Transit | CT staff |
| Everett Transit | Solutions for Government (SFG) and City staff |
| Sound Transit | To be determined at implementation |
| Washington State Ferries | WSF staff |

13.2.2.1 King County Metro (DR 110.02)

- (a) Daily sales reports shall be provided to the Finance Department for automated and/or manual entry to the general ledger or accounts receivable system(s). Sales information shall be broken down by pass type and by vendor identifier (e.g. Consignment, Group Sales, RFCS managed sales). Transaction revenue (from stored value) shall be broken down by Peak, Off-Peak, and Special fares (Senior, etc.). Files for automated entry shall be provided using ASCII file export or ODBC connection.
- (b) Transaction level Ridership data (including driver and vehicle assignment information, and all trip data) shall be provided through electronic data transfer to the KCM server. This requirement could be met by the Import/Export Report requirements using either ASCII file export as an intermediate step, or direct ODBC transfer if the KCM Transit Distribution Database supports this.
- (c) Currently, KCM's administrative business day is defined as 8 a.m. to 5 p.m. KCM maintains a separate "service day" for transit operations.

13.2.2.2 Kitsap Transit (DR 110.03)

- (a) Daily revenue reports from the RFC system shall be provided by fare type. These will be manually entered into the existing Fundware general ledger system.
- (b) On a daily basis, ridership data from the client application shall generate a formatted ASCII data file via the client application data

export feature. This data file/ODBC connection data shall be imported into an existing Microsoft Excel system.

- (c) At the time this specification was written, a final decision about a new accounting system had not been made. The most likely product under consideration is "Fundware for NT". The Contractor shall provide functionality to export data to this product
- (d) Currently, KT's administrative business day is defined as 8 a.m. to 5 p.m.

13.2.2.3 Pierce Transit (DR 110.04)

- (a) RFCS revenue data shall be transferred to the existing finance system via ODBC type middle-ware, or by transfer command in the back office client application.
- (b) Pierce Transit operates a financial system using an Oracle RDBMS.
- (c) Currently, PT's administrative business day is defined as 8 a.m. to 5 p.m.

13.2.2.4 Community Transit (DR 110.05)

- (a) Community transit is implementing a new ERP system based on Oracle financial packages, using Oracle 7.3.n or Oracle 8 as the back-end. The client application shall interface with this system via ASCII data file transfer in CSV format or direct ODBC connection to a workstation provided by CT.
- (a) The Contractor shall provide daily revenue reports broken down by fare and pass types. These numbers will be manually entered into the GL system.
- (b) Community Transit has contracts with third-party transit providers, who are responsible for their own revenue reporting. The back-office client application shall report all third party fare card revenue, summarized by provider.
- (c) Currently, CT's business day is defined as 8 a.m. to 5 p.m.

13.2.2.5 Everett Transit (DR110.06)

- (a) Daily reports from the RFC system shall be provided summarizing sales by fare type. These will be manually entered into the existing financial systems. Currently, Everett Transit hosts a legacy COBAL financial system called SFG. They also use Microsoft Excel to aggregate revenue and ridership data. Everett Transit has no current plans to upgrade their existing systems.
- (b) Currently, ET's administrative business day is defined as 8 a.m. to 5 p.m.

13.2.2.6 Sound Transit (DR 110.07)

Sound Transit (ST) is implementing an Automated Fare Collection system that will eventually become integrated with the RFCS. ST's system will collect fare data from ticket vending machines and validators, and transfer that data to the Central Data Control System (CDCS). The CDCS will provide the ST interface with the client application and clearinghouse system.

Sound Transit will also be installing fare collection (farebox and RFCS fare card) equipment on new bus services.

- (a) The RFCS Contractor shall coordinate with the ST Contractor to provide the necessary information to integrate the ST system into the RFCS. The ST Contractor will be responsible for making any necessary modifications to the CDCS to accommodate the upload of information from CDCS to the RFCS clearinghouse.
 - i. The RFCS Contractor shall provide ST with the application software to transfer RFCS transaction data from the CDCS to the clearinghouse system.
 - ii. The RFCS Contractor shall provide ST with the software drivers and RFCS card application for the TVM card readers.
- (b) The RFCS Contractor shall provide to ST the transaction data format required to complete modifications to CDCS for transaction uploads to the clearinghouse. Refer to Appendix B-5 for a preliminary list of messages. These messages are subject to change as Sound Transit implements its Ticket Vending Machine project.
- (c) Currently, ST's administrative business day is defined between 8 a.m. – 5 p.m..

13.2.2.7 Washington State Ferries

Washington State Ferries is implementing a Revenue Collection system (RCS) that will be integrated with the RFCS as described in Section 6.III-16. The RCS will collect smart card fare data through the RFCS, and will provide the interface to RFCS subsystems and the clearinghouse.

- (a) The Contractor shall coordinate with WSF and the RCS contractor to provide the necessary information to integrate RFCS systems with the RCS.
- (b) The Contractor shall provide WSF with the application software to transfer RFCS transaction data from the RCS to the clearinghouse.
- (c) Currently WSF's administrative business day is defined as 8:00 a.m. to 5:00 p.m. WSF maintains a service day from 4:00 a.m. to 3:00 a.m. the following calendar day.

13.2.3 RFCS Client Application Support

- (a) The Contractor shall provide on-site technical services necessary to fulfill the functional requirements of each Agency's back-office functions connected with the RFC system.
- (b) The Contractor shall provide scheduled and emergency on-site maintenance of the client application.

6.III-13.3 Data Exchange and Reporting Requirements

- (a) The RFCS shall provide the following minimum data exchange and reporting between the clearinghouse and each Agency's existing revenue and ridership systems:
 - i. Standard System Performance
 - ii. Standard Ridership and Revenue
 - iii. Ad-hoc Ridership and Revenue
- (b) All reports shall be generated using a query language and standard query engine (to be approved by the Contract Administrator) that provides flexibility for future updates, and for creation of new reports.
- (c) Report writer software shall include the ability to generate graphs and charts based on criteria and format defined by the user.
- (d) Where applicable, shall be designed to generate with variable data and time parameters allowing dynamic user selectable criteria such as start/end dates and data content. Report generation may be restricted by processing rules when necessary to minimize impacts on system processing resources (such as preventing full database passes).

13.3.1 Standard System Performance Reporting

Where applicable, the RFCS shall generate the following standard system reports automatically on an agreed schedule defined for each report. When required, and respective of system processing rules, the report(s) may also be run on demand. Report generation may be restricted by processing rules when necessary to minimize impacts on system processing resources (such as preventing full database passes)

- (a) Financial management reports, including as a minimum:
 - i. Daily Sales by Participant
 - ii. Daily Sales by Payment Type
 - iii. Exception Items
 - iv. Missing Add Value Transactions
 - v. Net Settlement Position for all program participants
 - vi. Daily Settlement Position reports including:
 - (2) Settlement account and bank account identifiers
 - (3) Purse transactions summarized by sales, fare payments, transfer adjustments, refunds, and escheatment value transfers
 - (4) Sales transactions summarized by purse sales, sales of own products, sales of other Participants products
 - (5) Other transactions summarized, including but not limited to (based on Participant), manual adjustments, apportionment values, expired transaction value, transfers from Institutional or Lead Agency accounts
 - vii. Transaction summary information based on the Clearinghouse settlement date for Agency, centralized role, or retailer
 - viii. Transaction summary information showing when transactions were processed through settlement, by the Agency's reconciliation date
 - ix. Claim transactions for all system participants
 - x. Manual adjustments
 - xi. Total liability owned by the Agencies for Purse Values
 - xii. Provide details of all inactive cards to support both internal and Washington State escheatment processes

- xiii. Automatic revalue transaction information, including product type, volume and value, reflecting the date the fare card was updated with the value
 - xiv. Revenue from sales of regional passes apportioned across Agencies. Data will be subject to appropriate system business rules that govern calculation and allocation of regional pass revenue
 - xv. Revenue from Purse Transfers distributed and adjusted for all Agencies. Data will be subject to appropriate system business rules that govern calculation and allocation/re-allocation of purse transfer revenue
 - xvi. Revenue from sales of regional passes within Institutional programs apportioned across Agencies participating in the program. Data will be subject to appropriate system business rules that govern calculation and allocation of regional pass revenue
 - xvii. Instances of NSF transactions results from a bad check or post payment automatic revalue
 - xviii. Successfully processed card refunds
 - xix. Statistics about the sales made at a 3rd Party Retailer and their associated locations
- (b) General management information reports, including as a minimum:
- i. System utilization reports
 - ii. Fare card reliability statistics, measuring the rate of failures
 - iii. Device reliability for all device types in the program. This should exclude failures such as power outages, accidents or mishandlings
 - iv. Device status and availability, including historical data
- (c) Contractor provided customer service reports, including as a minimum:
- i. Call center level of service and performance against quality standards
- (d) Website performance data including statistics on the use and uptake of all areas of the RFCS website pages
- i. Summary of activity by hour, day, and month
 - ii. Ridership by web page, including total number of hits, hits by entry pages, and hits by exit pages

- (e) Institutional program reports, provided to both the Agencies and institutions, including as a minimum:
 - i. Institutional program participation based on RFCS fare media usage on a RFCS card.
 - ii. Institutional program ridership statistic summaries showing the cash equivalent value and the value actually received by the Agency providing the transit service.
 - iii. Institutional program ridership statistics by Agency providing the transit service, the route, and other fare payment transaction detail.
 - iv. For Agencies and Commercial Accounts only, provide transaction history for Institutional cards (monthly or for specified date range).
 - v. Billing data including summaries of redeemed/unredeemed vouchers and customized programs.
 - vi. Institutional program data to show the number of cards issued in an Institutional program, the products on the cards and whether the products and card being actively used or not.
 - vii. Details of products that an Institution has ordered, but were never redeemed during the billing or agreement period.
 - viii. Details of vouchers that an Institution has ordered, but were never redeemed during a specific period.
 - ix. Vanpool use by Institution, Vanpool ID, Agency, and/or card serial number, accessible by the vanpool administrator at each Agency.
 - x. Details of vanpool subsidies used on vanpool services, accessible by the vanpool administrator at each agency.
 - xi. Business Account transaction history report which excludes the card serial number and passenger type fields.
- (f) Card management reports, including as a minimum:
 - i. Detailed list of all smart cards by RFCS location, type and card status, throughout the asset management lifecycle
 - ii. Details of all Agency orders in the RFCS
 - iii. Delivery performance
 - iv. Bad stock, returns, and defects
- (g) System maintenance reports (DR 110.09), including as a minimum:
 - i. System-wide inventory report

- ii. Device faults and support services statistics
- iii. Device warranty periods (including current and extended periods)
- iv. Status of all device support reports managed by the Contractor repair center, by Agency (location and owner), and device type
- v. Details of devices (non-spare) that did not connect to a DAC during the reporting period
- vi. Provide audit data to assist in confirmation that transactions are sent from devices, received, and processed by the Clearinghouse.

13.3.2 Standard Fare Card Ridership and Revenue Reporting

13.3.2.1 National Transit Database Reporting (DR 110.10)

- (a) The RFCS shall generate data extracts of unlinked passenger trips for each Agency to use to prepare their NTD reports. The extracts shall include:
 - i. Annual unlinked passenger trip totals.
 - ii. Average weekday, Saturday and Sunday unlinked passenger trip totals.
 - iii. Unlinked passenger trips by mode including motor bus, trolley bus, vanpool, rail, and demand responsive services.
- (b) The RFCS shall generate data extracts with passenger fare information for each Agency to use to prepare their NTD reports. The extracts shall include:
 - i. Total passenger fares.
 - ii. Fares by fare category, including as a minimum full-fare (adult), senior citizen, student, special fares.
 - iii. Fares by mode, including as a minimum motor bus, trolley bus, vanpool, rail, and demand responsive services.

13.3.2.2 Common Ridership and Revenue Reporting (DR 110.11)

The RFCS shall generate the following ridership and revenue reports for each Agency.

- (a) Ridership reports containing information as listed below. The reports will run daily, monthly, and by user-specified date range:
 - i. Route.
 - ii. Agency or contractor owning coach.

- iii. Service or agency operated under.
 - iv. Transit Operator (where applicable)
 - v. Fare category (per the fare categories of each respective Agency), and exceptions or upgrades.
 - vi. Fare payment type and value of payment.
 - vii. Average weekday ridership (monthly report).
 - viii. Average Saturday ridership (monthly report).
 - ix. Average Sunday ridership (monthly report).
 - x. Unlinked trips boardings).
 - xi. Intrasystem transfers for a standard reporting period (e.g. Monthly) and available on-demand for a user-selected period. The report should also be available on-demand at the Route level if specified.
 - xii. Intrasystem transfers for a standard reporting period (e.g. Monthly) and available on-demand for a user-selected period. The report should also be available on-demand at the Route level if specified.
- (b) Monthly status of the number of fare card issued in the reporting period. Provide a breakdown of the revenue earned by Agency by:
- i. The value of the products added to those cards by product type in the reporting period.
 - ii. The number of fare cards used in the period and the revenue earned by Agency, by product.
- (c) Pass/Multi-Ride sale/revalue summaries, broken down by:
- i. Sales/revalue location identification.
 - ii. Product (type and face value).
 - iii. Revalue amount.
 - iv. Subsidy amount and type.
- (d) Fare underpayment report to identify those transactions in which additional cash fare was required (not whether it was paid), including the following information:
- i. Card serial number.
 - ii. Product (type and face value).
 - iii. Route identification.
 - iv. .Expected amount.

- v. Amount of underpayment.
 - vi. Route owner or transit operator.
- (e) Counts from regional counters for non fare card usage

13.3.3 Ad-Hoc Fare Card Ridership and Revenue Reporting

Through the back office client application, the RFCS shall provide each Agency with the ability to prepare ad-hoc reports (DR 110.12) using business views created either directly against data generated by RFCS devices or derived from data supplied by the Agencies and imported in the RFCS. The reporting ability should include at a minimum:

- (a) Transaction-level reports for user-defined start and end dates, including at a minimum the following fields or subset thereof defined by the user. The data available will be constrained according to the relevant system business rules regarding transaction validity, availability, and governing revenue determination and allocation:
- i. Card Number or Identifier
 - ii. Institutional ID
 - iii. Vehicle ID
 - iv. Route ID
 - v. Run ID (bus and rail)
 - vi. Trip ID (bus and rail)
 - vii. Device ID
 - viii. Vehicle owner, route owner, or transit operator
 - ix. Date of transaction
 - x. Time of transaction
 - xi. Amount or value of transaction and product type
 - xii. Valid fare payment, upgrade or underpayment
 - xiii. Linked or unlinked trip
 - xiv. Agency transferring from (if applicable)
 - xv. Route or terminal transferring from (if applicable)
 - xvi. Run transferring from (if applicable)
- (b) Statistical and research reports using user-defined criteria. Examples include:
- i. Usage characteristics for user-defined customer market segments, potentially broken down by type of fare payment

- used (cash, purse, pass, multi-ride etc.), route, period of travel, and/or frequency of travel.
- ii. Product type used versus cash equivalent full fare value.
- iii. Card revalues by revalue location.
- (c) Functionality for generating reports on a regional basis, including linked trips, unlinked trips, and transfers for any combination of Agencies in the region. Provisions shall be included to limit user access to Agency-specific data per permissions and policies of each individual Agency.
- (d) Financial management reports using user-defined criteria. Examples include:
 - i. Card account activity
 - ii. Financial trend analysis
- (e) Fraud management reports using user-defined criteria. Examples include:
 - i. Transactions by specific card(s)
 - ii. Transactions on lost, stolen, damaged, or replaced cards
 - iii. Transactions occurring at any location outside of specified business hours
 - iv. Transactions by device or CST operator
- (f) Boardings and revenue associated with ridership transfers, purse transfer and linked trips between Sound Transit and local Agencies (Community Transit, Everett Transit, King County Metro, and Pierce Transit) on a daily, weekly, monthly, and year-to-date basis. The information provided will be constrained by system business rules governing revenue calculation and allocations.
 - i. Total value of purse transfers and linked trips between Sound Transit and each local agency classified by each type of product, full payment by purse, and payment by product and purse indicating product classification used and amount of purse upgrade.
 - ii. Allocation and disbursement of actual revenue collection between Sound Transit and each local agency.
- (g) Boarding and revenue associated with linked trips and purse transfers between local agencies (Community Transit, Everett

Transit, King County Metro, and Pierce Transit), based on the system business rules governing revenue calculation and allocation.

- i. Total value of linked trip and purse transfers between local agencies classified by each type of product, full payment by purse, and payment by product and purse indicating product classification used and amount of purse upgrade.
- ii. Allocation and disbursement of actual revenue collected between local agencies.

13.3.3.1 Agency Specific Fare Card Ridership and Revenue Reporting

In addition to the standard and ad-hoc reports, the Contractor shall provide data extracts of transaction summary data from the BOC and transaction data from the Clearinghouse to support the ability for Agencies to create Agency specific reports on an ad hoc basis. (DR 110.13). Sample report formats are contained in Appendix B. Except where noted, the Contractor may provide alternative report formats, subject to approval by the affected Agencies.

The ad hoc reports will be created either directly against data generated by RFCS devices or derived from data supplied by the Agencies and imported into the RFCS. The data may be available at the Clearinghouse or at the Back Office Computer.

(a) King County Metro

The Contractor shall provide the ability to create ad hoc reports to support the following KCM needs (samples of King County reports are provided in Appendix B-2).

- i. Purse, pass, multiride revenue associated with passenger trips
- ii. Number of passes in use
- iii. Monthly and year-to-date totals for all fare card product transactions by fare category type
- iv. Monthly passenger trip counts for all product transactions broken down by day of month and day of week, showing the total number of riders per day for each category of transaction
- v. Daily total for all fare card product transactions to illustrate the outstanding fare media in use and sold for the month

(b) Kitsap Transit

The Contractor shall provide the ability to create ad hoc reports to support the following Kitsap Transit needs (sample of Kitsap Transit reports are provided in Appendix B-3):

- i. Driver shift report listing rider head count over the span of the shift.
- ii. Ridership counts broken down by weekdays, Saturdays, or Sundays.
- iii. Number of riders by route location and total passengers for the location for the specified timeframe.

(c) Pierce Transit

The Contractor shall provide the ability to create ad hoc reports to support the following Pierce Transit needs (samples of Pierce Transit reports are provided in Appendix B-4):

- i. Revenue and ridership reporting compatible with the Average Daily Ridership report described in Appendix B-4. The first two (2) pages of E-4 contain a sample report that shows how Pierce Transit breaks up bus fleets and route categories. This is provided for illustrative purposes, but does not include the full range of fields that will be required for RFCS implementation.
- ii. Wheelchair lift utilization by fleet type (boardings only)
- iii. Bicycle boardings by route and fleet type
- iv. Average and Peak Report

Peak ridership is the average (over multiple days) of the maximum number of passenger boardings in a specified time period.

- (1) Average Weekday Ridership
- (2) Average Saturday Ridership
- (3) Average Sunday Ridership
- (4) Seattle Express Northbound Peak
- (5) Seattle Express Southbound Peak

Examples of these charts have been provided in Appendix B-4.

- vi. Average and total passenger boardings by trip number and route. This may be included as part of the Common Ridership and Revenue Reports described in 13.3.2.2.
- vii. Monthly reporting by revenue categories, totals by product, and totals by fare type. The data available will be governed

by the system business rules regarding revenue allocation and distribution. The RFCS may cause some product types to be obsolete, and may add new types to the report. An example is contained I Appendix B-4.

- viii. Daily sales counts of products by sales outlet. The example report is an excellent resource for product types that the system shall support for integration with Pierce Transit.

(d) Community Transit

The Contractor shall provide the ability to create ad hoc reports to the following Community Transit needs (samples of Community Transit reports are provided in Appendix B-1):

- i. Number of passenger boardings by route and performance center for weekdays, Saturdays, and Sundays.
- ii. Payment type (cash, purse, period pass, transfer, etc.) and amount. By route and performance center for weekdays, Saturdays, and Sundays.
- iii. Product type by route and performance center for weekdays, Saturdays, and Sundays.
- iv. Fare category (senior, youth, disabled) by route and performance center for weekdays, Saturdays, and Sundays.
- v. Number of transfers to/from other RFCS transit systems and the associated routes.
- vi. Number of intrasystem transfers at the route and performance center level.
- vii. Provider reports:

This category is required for CT to support their existing business practice of multiple service contracts. The Contractor shall provide the ability to generate ad hoc reports for quarterly ridership and revenue summary reports for each contracted transit operator. The availability of revenue data is governed by the system business rules used to calculate and allocate revenue.

- (1) Sales by retail location, including the total of each category of item sold
- (2) Sales by performance center
- (3) Sales by retailer
- (4) Summary of cash receipts by category that reconciles with the daily total cash receipts

(e) Everett Transit

- i. The Contractor shall provide ad hoc reporting capability for the preparation of Everett Transit reports.

(f) Sound Transit

The Contractor shall provide data exchange for the preparation of reports by Sound Transit's CDCS per the data requirements contained in Appendix B-5. Additional data exchange and financial reporting requirements for Sound Transit, beyond the standard reports, is currently under review.

(g) Washington State Ferries

The Contractor shall provide ad hoc reporting capability for the preparation of WSF reports with content as listed under 6.III-13.3.4.1 (King County Metro).

13.3.5 Non-Fare Card Transaction Reporting (DR 110.14)

- (a) At the direction of each Agency, the reports listed in Sections 13.3.2, 13.3.3 and 13.3.4 shall include and consolidate non-fare card data collected through the fare transaction processor and data acquisition system.
- (b) Non-fare card data shall be listed as one or more additional fare types. As a minimum, a "cash" fare type shall be included.

6.III-13.4 General Computing Environment

The intent of this section is to illustrate general industry guidelines and Agency preferences for hardware and operating system software. It is also the intent of this section to include, and not limit this application to, a multitude of application technology solution types for the Agency Back-office Integration.

- (a) The Contractor shall provide a back-office solution that is compatible with the computing environment of each Agency.
- (b) The Contractor shall provide the exact specifications for new systems to be integrated with legacy systems to the Agencies and their designates, including other Contractors responsible for legacy systems.
- (c) The Contractor shall provide a means for users to manage processes or sub-processes (threads) of the client application. This requirement may be fulfilled by using native operating system utilities to monitor, pause, or terminate lengthy processes as needed.

13.4.1 Back-Office Client Application Computer

- (a) The Back Office Client Application Computer shall meet minimum standards as listed in Section 6.III-12.4.1, and shall be approved by the Contract Administrator (DR 110.15):
- (b) Data back-up and redundancy shall be provided to protect against data loss.

6.III-13.5 Performance Requirements**13.5.1 Back-Office Client Computer**

- (a) Upon database query, print, or any other application function, the application shall return control to the user within five (5) seconds of initiation.
- (b) All transactions shall be successfully processed.

13.5.2 Data Transfer and Report Generation Response Time

- (a) Fare Table Updates: Fare table transfer to the clearinghouse system shall be completed in less than ten (10) seconds.
- (b) Standard Reports: Existing instances of standard reports shall be generated in less than ten (10) seconds (this does not include the printer time to complete the output). On-demand generation of standard reports will vary based on the complexity of the data set and selected parameters.

"Complete" is defined as - "Full control of the workstation has returned to the user". Background processing strategies may be implemented to fulfill response time requirements.

13.5.3 Reliability and Accuracy

- (a) Reporting process: All reports shall perform the correct calculations for sub-totals, totals, and summary information (all derived information) with 100% accuracy. The underlying standard report design (including mathematical formulas) shall be available to the Agencies for review.
- (b) Fare table updates: The Back-Office Client shall correctly transfer the Fare Table revisions to the clearinghouse system with 100% accuracy.
- (c) Transaction recording functions: The Back-Office Client shall correctly store information into the clearinghouse database with the appropriate field and form level validation.

6.III-13.6 Installation Requirements

- (a) The client application and all of its supporting hardware and software shall be installed by the Contractor. At each Agency's discretion, Agency personnel may perform the installation.
- (b) The Contractor shall design and develop a simple to use installation program for the client application software. This program should be designed so that non-technical staff may install the client application. The instructions for installation may include directions for requesting network connections, and login accounts from application, or network administrators.

6.III-13.7 Additional Security Requirements

The Contractor shall provide the following additional requirements:

- (a) All direct access to clearinghouse system data shall be read-only, except for Fare Table updates.
- (b) For the client application, the Agencies shall have the ability to assign access privileges to their employees for processing of data downloaded from the DACS or clearinghouse system to the local RFCS back-office client application. Employees shall not be able to modify fare card data to be forwarded from the DACS to the clearinghouse system.
- (c) All query operations, audit control logging, and errors on the client application shall be logged in a separate ASCII file or database.

6.III-13.8 Documentation Requirements**13.8.1 Back-Office Client Application**

The following documentation for the back-office client application shall be provided.

- (a) Agency Operations Manual
- (b) System Administration and Installation Manual
- (c) User Manual

13.8.2 Back-Office Integration (Agency-Specific)

The following documentation shall be provided describing the integration at each Agency:

- (a) System Integration Architecture Diagrams and Documentation
- (b) System Installation Procedures

- (c) System Maintenance Procedures
- (d) System Performance Monitoring Strategy and Procedures
- (e) System Test Plans and Procedures
- (f) Emergency Technical Support Procedures
- (g) Bug-Fix Reporting and Software Service Pack Release Request Procedures

6.III-14 NON-FARE APPLICATIONS (OPTION)**6.III-14.1 Description**

The Agencies have identified the following non-fare application (CDRL 40) to be included as an option in the Regional Fare Coordination System. The Contractor shall also consider future incorporation of the Non-Fare Application described in Section 6.III-16.8.

The Contractor shall include the following Non-Fare Application:

- (a) A Parking Revenue Collection System (PRCS) for Pierce Transit, to be installed at the Tacoma Dome Station Parking Garage. Detailed requirements for the PRCS will be provided at the time of Option execution.

6.III-14.2 General Requirements

- (a) All non-fare applications shall utilize RFCS smart card technology.
- (b) Non-fare applications shall not impact the functionality of the transportation application.
- (c) Non-fare applications shall not impact the performance of the transportation application.
- (d) Non-fare applications shall be extensible to other sites, other similar applications, and other agencies.

6.III-14.3 Parking Revenue Collection System**14.3.1 Functional Requirements**

- (a) The Contractor shall provide the following parking revenue collection system card configuration options on a single card:
 - i. Parking revenue collection system application only.
 - ii. Parking revenue collection system application and RFCS transportation application.
- (b) The parking revenue collection central equipment shall be expandable to include the future addition of other parking facilities.
- (c) The parking revenue collection system shall be extensible to other Agencies.

6.III-15 SYSTEM EXPANSION AND POTENTIAL FUTURE APPLICATIONS**6.III-15.1 Description**

The following are examples, provided for background information only, of the types of future potential RFCS smart card applications that have been identified to date. These specific applications will not be evaluated in the Contractor selection process. With these types of applications to consider, the Contractor should describe in general terms the characteristics of its system architecture, card design and operating policies which would allow for additional non-RFCS applications to the RFCS card. The system proposed will be evaluated and scored based on its capability to expand and incorporate future, additional applications.

15.1.1 King County Access Identification and Access

This includes integrating the RFCS card with existing building identification and access systems for a number of current and future King County building and garage facilities. Estimated card and reader quantities and technical information on existing identification and security systems is contained in Appendix C.

15.1.2 Car Sharing Program

Car sharing, a program to be co-sponsored by King County Metro, the City of Seattle, and the University of Washington would provide access to automobiles without the costs and hassles of auto ownership.

Car sharing is similar to typical car rental services; however, vehicles are parked within walking distance of home or work and billing is based on an hourly rate, rather than a daily rate. Reservations are made by phone or on the Internet and fees are based on time and miles driven. There is typically an initial refundable deposit to subscribe to the service. All insurance is included in the mileage and hourly rates. For more detail on how the program works, see the King County Metro website:

<http://transit.metrokc.gov/tops/oto/carshare.html>

King County Metro and Kitsap Transit are also interested in a car sharing type program focused on the ferry commuter. Vehicles might be placed near ferry terminals that would be available to people who have taken the ferry. These vehicles might be part of a HOV commute trip or might be available for emergency service when a regular transit service is not available. The smart card would be used to access these vehicles and track usage.

15.1.3 City of Seattle “City Card”

The City of Seattle is considering the development of a “city card” based on European models where citizens have a card to access various city services and benefits and pay utility bills, parking tickets, parking meters, pet licenses, garbage stickers, etc. as well as link to regional transit systems, monorail, car sharing, and guaranteed ride home services. Additionally, in return for performing community service Seattle residents may get benefits such as purchase of discounted tickets at publicly-subsidized facilities like the aquarium and the zoo, discounted purchases at stores, credit on City utility bills, et al. The Seattle Smart Card would be available only to Seattle residents, providing an attractive transportation and civic benefit for people who live in Seattle.

15.1.4 Transit Oriented Development – Fare Incentives and Secured Access

King County plans to use smart card technology to provide transit pricing incentives for residents at Transit Oriented Development (TOD) sites, and for secure parking and building access at these sites. In January, 1998, King County launched a new TOD program to create opportunities for new multi-family housing and related development near bus transit facilities in its urban centers. The two (2) primary goals of this program are to increase bus ridership and to achieve a greater jobs/housing balance in the region by creating communities where public transportation use is convenient.

King County is currently undertaking six (6) pilot projects for this program. Downtown Renton and Redmond Overlake are under construction, and developer selection/construction is pending on the Northgate, Olson-Myers park and ride and the Doces (downtown Seattle) sites. A new pedestrian bridge has been constructed just south of King Street Station connecting the north Kingdome lot and Pioneer Square to existing Metro bus and future Sound Transit commuter-rail and light-rail stops. Further development of the north Kingdome lot is expected in the future.

For more information, go to:

<http://www.metrokc.gov/kcdot/alts/tod/index.htm>

6.III-15.2 King County Identification and Building Access**15.2.1 Functional Requirements**

- (a) The Contractor shall provide an identification and building access system for the following King County building and garage facilities:

- i. The Regional Justice Center located in Kent, Washington.
- ii. The King County Correction Facility in 2001/2002.
- iii. Buildings within the General Government building system including (at present): the Courthouse, Administration Building, Garage, Yesler Building, and remote sites; Ryerson Transit Base, Issaquah District Court, Department of Youth Services, Alder Complex, and the King County Sheriff's MARR Impound Lot.
- iv. King Street Facility.
- v. The Black River Building located in Kent, Washington.

Information on the equipment at these facilities is contained in Appendix C.

- (b) The Contractor shall supply fare cards compatible with the existing identification and building access system. The existing system utilizes Motorola Indala AC132 26 bit cards. The total estimated number of cards is 20,000.
- (c) In the event the proposed fare card is not compatible with the existing systems, the Contractor shall supply the cards, readers and all other systems and equipment required for the identification and building access system. The total estimated number of readers (not including spares) is 400. Equipment information can be obtained from the manufacturer's Internet web sites as listed in Appendix C.
- (d) The identification and building access system shall use site codes and card /employee numbers as provided by King County.
- (e) The identification and building access card shall be inter-operable across all facilities, subject to individual access permission.
- (f) The Contractor shall provide the following identification and building access card configuration options on a single card:
 - i. Identification and building access application only.
 - ii. Identification and building access application and RFCS transportation application.
- (g) The Contractor shall be responsible for integrating new equipment and services with existing central monitoring, control, network management, and reporting systems.
- (h) New equipment and services shall be compatible with existing communications and electrical supply.

- (i) Cards issued for identification and building access shall be dye sublimation compatible with the existing systems.

15.2.2 Performance Requirements

- (a) New equipment and systems shall not impact the performance of existing central monitoring, control, network management and reporting systems.
- (b) New equipment and systems shall meet or exceed all current data storage and processing performance measures.

6.III-15.3 Car Sharing Program

15.3.1 General Requirements

RFCS cards could be used to perform the following functions of the car sharing service:

15.3.1.1 Access to Vehicles

The card would act as the subscriber's ID card. The on-board access control system would recognize the user as the correct subscriber and allow access into the vehicle. Subscribers gain access to the vehicle by holding their card next to an access device located on the front dash of the car.

15.3.1.2 Access to the Lock Box and Ignition Key, or Vehicle Based Security System

The card, in conjunction with a PIN number, would allow access into a lock box that may be installed inside the vehicle or located close to the vehicle. The vehicle ignition key would be stored inside the lock box.

The card, in conjunction with a PIN number, would allow on board security ignition system to start vehicle for approved driver.

15.3.1.3 Record Keeping for Billing

Card access to the lock box would also act as a record keeping function for customer billing. Billing, which is based on mileage and hours used, could be handled in two ways. Fees could be deducted from the value stored on the card, or fees could be billed to a subscriber's credit card account.

15.3.1.4 Reservations by Phone

Cards would be used for reservations over the phone wherever the phone is properly equipped for such use.

15.3.1.5 Gasoline and Car Wash Purchases by Subscribers

Gasoline and car washes purchased by the subscribers will be reimbursed by the car sharing organization since these costs are included in the mileage and hour usage fees. Subscribers would use their card to access gasoline and car wash services; however, these expenses would be billed to the car sharing organization.

15.3.1.6 Access to Secured Parking Garages

The card would allow access to secured parking garages for after hours access to vehicles. The access may be through the building security system or through an interface unit that translates authorization to the security system.

6.III-15.4 City of Seattle "City Card"

15.4.1 General Requirements

RFCS cards could be used to perform the following "City Card" functions:

15.4.1.1 Community Service Component

Volunteer and community work would be rewarded at a set rate (e.g. \$10/hr.) The City would distribute Microsoft Access database compatible software to non-profit agencies where the volunteer work was performed. The agencies would send the information (by e-mail if the database isn't larger than 2 megabytes) with number of hours worked and amount of credit earned to the central processing system. Smart card readers and sales points would be installed at each Neighborhood Service Center (i.e., a storefront office with personnel to conduct City business and address citizen inquiries). When citizens use their smart cards at Neighborhood Service Centers to pay bills, their smart card would be credited for the

volunteer hours. Smart card readers may also be installed at the Zoo, Seattle Center, or the Aquarium and with participating merchants to pay all or a portion of entrance fees and/or goods and services purchased. Funds would be provided to the clearinghouse by the City (raised from foundations and private sources, or from fees paid by merchants or banks) to subsidize this program.

15.4.1.2 Linkage with the Regional Fare Coordination System

The City would coordinate system design and procurement with King County and the Regional Fare Coordination contractor to tailor the Seattle Card to be compatible. The Seattle Card would have additional functions unique to the City, which would be negotiated with the RFC system contractor.

15.4.1.3 Potential Linkage with Merchants and Long Distance Telephone Systems

The New York Chase/Citibank pilot, which enlisted 650 merchants, may be a model for this part of the Seattle project. Restaurants, department stores, Laundromats, vending machines and taxicabs are potential card acceptors. Each business would have a smart card reader. Some might even be replenishment stations to add more value to the cards.

15.4.1.4 Potential Linkage with the Washington State Electronic Benefits Transfer System Project

The State, through the Department of Social and Health Services (DSHS) is a member of a seven state consortium developing a magnetic stripe Electronic Benefit Transfer (EBT) system through Citibank which will begin to go on-line next year. DSHS feels that within five (5) years there may be a conversion to smart card technology. At this time, most food stores that accept food stamps have debit and credit card reader equipment that can be reprogrammed to accept the new EBT Card. The Seattle Smart Card might initially contain both a chip and a magnetic stripe contact interface to link with the EBT Project. Eventually, the State might adopt the Seattle Smart Card system as the next generation EBT card with potential savings in time and research and development costs.

6.III-15.5 Transit Oriented Development – Fare Incentives and Secured Access

RFCS cards would be used to provide fare incentives and secured access for participants in the six (6) Transit Oriented Development pilot projects, and for future expansion of the TOD concept.

6.III-16 WSF IMPLEMENTATION REQUIREMENTS**6.III-16.1 Description**

Washington State Ferries (WSF) intends to replace its existing revenue and traffic data systems starting in 2004 or 2005. Implementation in the WSF environment will include installation of electronic fare collection equipment in conjunction with this revenue and traffic data systems replacement. This Section outlines WSF specific requirements for RFCS equipment to be implemented in coordination with the revenue and traffic data systems replacement.

6.III-16.2 Commercial Account Program

The Commercial Account Program is operated by Washington State Ferries to provide a post service payment mechanism to commercial account customers for the transportation of vehicles and staff on WSF ferry services. Commercial account customers include private organizations, as well as government, academic and other public institutions. Each Commercial Account has a unique identification number, which is used to check that the trip is charged to a valid account.

Commercial Account customers are billed for actual trips taken at the normal full-fare cost. Frequency of use discounts are provided for certain fare types as described in the WSF Tariff.

In addition to the Common Institutional Program Requirements described in Section 6.II-2.2.1, the Contractor shall meet the following Commercial Account Program requirements:

- (a) The Commercial Account fare card shall be initialized with a six digit Commercial Account identification number, specific to each commercial account customer. All cards issued to the Commercial Account Customer shall have the same identification number. This shall be in addition to the card-specific unique serial number.
- (b) The Commercial Account payment option shall only be valid for travel on WSF services, and shall be valid for all forms of walk-on or vehicle-based travel. Transaction information shall be collected at WSF terminals.
- (c) At the point of use, the RFCS shall confirm that the Commercial Account Card and identification number are valid. Invalid cards shall be rejected, and the Commercial Account product on the card shall be rejected as payment.
- (d) Fares shall be computed at the time of card use, and adjusted with post-use frequency of use discounts, computed and applied per the provisions of the WSF Tariff.
- (e) Payment shall be on a post-use billing basis.

6.III-16.3 On-Call Maintenance Service Levels

In addition to the requirements described in Exhibit 15 Post Warranty On-Site Maintenance, the Contractor shall meet the following requirement:

- (a) For remote ferry locations (i.e., Anacortes, San Juans, Port Townsend and Keystone), Contractor shall arrive on-site within 4 hours rather than 90 minutes.

6.III-16.4 WSF Implementation Criteria

In conjunction with replacement of revenue and traffic data systems, WSF has identified a two step implementation of the RFCS. As the revenue and traffic data systems replacement project proceeds, a decision will be made on whether to implement these two steps sequentially or in parallel.

Step 1: Walk-on Passengers. This includes the implementation of RFCS equipment to serve passenger-only routes, and walk-on customers on auto ferry routes in the system.

Step 2: Vehicle Stream. This includes the implementation of RFCS equipment at all vehicle toll booths.

6.III-16.5 Data Collection System

In addition to the Data Collection System requirements described in Section 6.III-12, Data Collection System, the Contractor shall meet the following requirement:

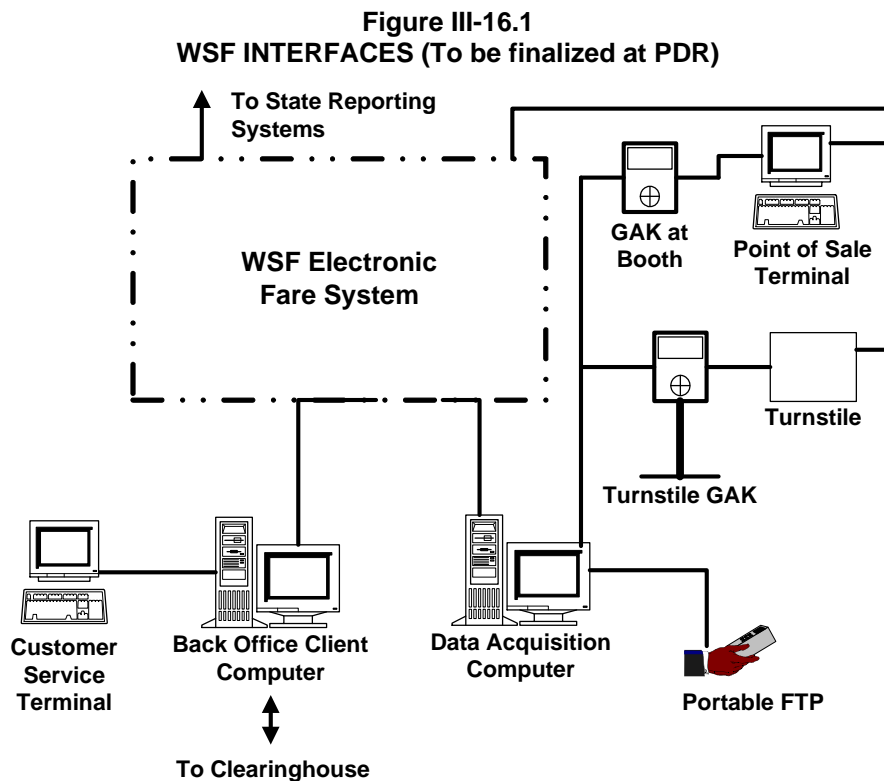
- (a) The Contractor shall provide appropriate environmental enclosures for the DACs that will be located at WSF terminals. Space restrictions will need to be accommodated at each terminal.

6.III-16.6 Data Exchange and Back Office Integration

Washington State Ferries is in the process of replacing its existing Point of Sale (POS) system with a new Electronic Fare System (EFS). The Contractor shall meet the following requirements for the integration of RFCS equipment with the EFS:

- (a) All records shall be of transaction-level detail and will be used by the EFS to process transactions and generate reports. Transaction-level data will also be transferred to other WSF and Washington State Department of Transportation systems. An example of transaction level data recorded by the current POS system is included in Appendix B-6.
- (b) The RFCS shall provide three interfaces to the EFS as illustrated in Figure III-16.1. The final architecture of the EFS and associated interfaces will be determined at Preliminary Design Review (CDRL 2). Interfaces shall include:

- i. A direct interface between GAKs installed at WSF toll booths and seller point of sale terminal. The point of sale terminal will determine the fare to be deducted (fare basis). The GAKs shall act as a peripheral to, and be under the operational control of, the point of sale terminal. The GAK shall deduct fares based on a fare basis message from the point of sale terminal, shall generate transaction detail and acknowledgment messages for the point of sale terminal, and shall forward transaction data to the RFCS.
- ii. An interface between data acquisition computers installed at WSF and the EFS to transmit in near real-time fare transactions from Portable FTPs.
- iii. An interface between the Back Office Computer and EFS for back office data integration as described in Section 6.III-13.



- (c) The Contractor shall provide an Interface Control Document (DR 110.16) fully describing these interfaces. This information will be provided to the RCS system developer.
- (d) For direct communications between the FTP and clearinghouse, a transparent path will be provided for batch data transfer through the RCS. The Contractor shall define requirements for such data transfer in DR 110.16.
- (e) Completion of the detailed interface design (Protocol modification required to be made to the baseline communications protocol as supplied) will be

provided as a separate document from DR112 by ERG during the period leading up to FDR submission of DR112b. The documents will describe the inter-device communication mechanism between the ERG GAK and a WSF POS, and the inter-device communication mechanism between the ERG GAK and a WSF gate. The physical communication method and protocol will be described in detail.

- (f) The Contractor shall design and build a WSF Gate and POS simulator that will enable the WSF GAK development, integration and testing to be completed. The simulator shall be built in two steps:
 - 1. Step 1 – a simple command line simulator for developer use.
 - 2. Step 2 – a graphical user interface (GUI) simulator for integration and test engineer use that will enable integrator and testers to run the GAK in the integration and test bed, both in Perth and Seattle.
 - 3. Instruction manual / user guide.

6.III-16.7 Food and Sundry Payment System (Option)

In addition to the Non-Fare Applications described in Section 6.III-14, the Contractor shall provide a Food and Sundry Payment System meeting the following requirements:

- (a) The Contractor shall provide a food and sundry payment system on Washington State Ferries vessels (CDRL 40).
- (b) The food and sundry payment system shall be used for purchases from the on-board concessionaire.
- (c) The Contractor shall supply all equipment and facilities required for the food and sundry payment system including as a minimum:
 - i. Card reading equipment co-located with all existing cash registers.
 - ii. Communications/data transfer system.
 - iii. Data management systems.
- (d) The Contractor shall make all arrangements with the on-board concessionaire to support the food and sundry payment system including as a minimum:
 - i. Installation, operation and maintenance of equipment.
 - ii. Revenue management.
 - iii. Revenue reporting.
- (e) The system shall provide functionality to block/unblock the food and sundry payment application at the discretion of the cardholder.

- (f) Transaction time for food and sundry purchases shall be a maximum of three (3) seconds.
- (g) Customers shall not be required to enter a personal identification number or other information for purchases.

6.III-17 Gate Adaption Kits

6.III-17.1 Subsystem Description – Gate Adaption Kits

Gate Adaption Kits (GAK) (DR112) shall be devices installed in Washington State Ferries (WSF) tollbooths and turnstiles. GAKs shall be designed for wall mounting of the GAK in tollbooths, mounting in turnstiles and remote mounting of the card reader.

- a) The Kiosk GAK (DR 112) shall be designed for integration as a peripheral to a new Point of Sale (POS) system being developed by WSF and shall include an interface for integration with the WSF Electronic Fare System (EFS) as a fare card payment-processing device.
- b) The GATE GAK (DR 112) shall be designed for integration with Turnstiles that are a component of the new POS system being developed by WSF and shall include an interface for integration with the new WSF EFS as a fare card payment-processing device.

At a minimum, the GAKs shall consist of the modules listed in Figure I-17.1

**Figure I -17.1
GAK CONFIGURATION SUMMARY**

| Modules | GAK |
|--|------------|
| Central Processing Unit | X |
| Contact less Card Interface | X |
| Card Reader | X |
| Power Supply Requirements | X |
| Communications with DAC and WSF revenue system | X |

6.III-17.2 Functional Requirements – Gate Adaption Kits

The following functional requirements supplement those stated in Section 6.III-3.2.

- (k) All Operational control of the GAK will be from the WSF EFS system via the Gate Controller (Inside the Gate) for the Gate and from the Point of Sale device for the POS.

- (l) The GAK supplied for WSF shall be able to conduct fare transactions as follows:
 - i. Automatically with no toll booth seller interaction when a card is presented and a default fare deducted or pass recorded.
 - ii. Through manual fare determination from WSF POS system. In this case, the fare will be computed by the WSF POS system, with the GAK acting as a payment acceptance peripheral. Valid pass products shall be recognized and applied to the cost of the fare. The remaining fare shall be deducted from stored value.

6.III-17.3 Physical Requirements - Gate Adaption Kits

17.3.1 Structural Features

- (d) The GAK mounts shall be designed for installation inside WSF tollbooths and turnstiles.

6.III-17.4 Data Exchange Requirements – Gate Adaption Kits

- (g) GAKs shall include a communications module for connecting to a DAC.
- (h) GAKs shall include a standard serial interface, designed for connection to WSF POS system. The Contractor shall provide an Interface Control Document (DR 112) fully describing this interface.

6.III-17.5 Installation Requirements - GAK

- (a) GAKs shall be designed to be installed on the tollbooth interior wall or inside a turnstile.
- (b) The Contractor shall provide the Contract Administrator and WSF with the bolt pattern mounting requirements and electrical/communications construction and connection details.
- (c) Conduit and power and communications cables leading from the power and communications sources to the junction box shall be installed by the WSF. Connections from the junction box to the GAK shall be the responsibility of the Contractor.
- (d) Contractor shall make final connections (plug-in) to power and communications.
- (e) WSF will provide the turnstiles with cut outs for card readers and mounting studs for the GAK.

- (f) WSF will provide a weatherproof electrical box at the exterior of the vehicle tollbooths for mounting of the card readers connected to the GAK installed in the interior of the tollbooths.